TEXT DIFFICULTY LEVEL OF SCIENCE TEACHERS' ASSOCIATION OF NIGERIA BASIC SCIENCE AND TECHNOLOGY TEXTBOOKS FOR PRIMARY SCHOOLS

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Abstract

The study sought to investigate the difficulty level of the Science Teachers Association of Nigeria (STAN) basic science and technology textbooks for primary schools used in Ekiti State, Nigeria. The stratified random sampling technique was used to select 270 pupils from primary 4, 5 and 6 from the six selected Local Government Areas in the State. The instruments used for data collection were Flesch-Kincaid Reading Ease Formula and Cloze test. The findings indicated that none of the three textbooks assessed is appropriate for the target readers. It is recommended among other things that text materials to be presented to primary school pupils should be of appropriate type corresponding to the reading levels and reading age of the pupils for easy understanding. In addition, word length and density of syllables of the textbooks should be reduced for easy comprehension.

Keywords: Flesch-Kincaid Reading Ease Formula, Cloze Test, Basic Science and Technology, Primary School, Science Teacher's Association of Nigeria (STAN).

Introduction

There is no doubt that the use of text materials can aid students learning in schools but little information is available on the reading difficulties of these text materials in Nigerian Primary Schools. Studies have found that textbooks have difficulty range. For example, Mustafa (2006) found that some texts can be read easily by the students while others are hard to read. Data also indicated that science textbooks are often too difficult for children to read (Ayodele, 2011), particularly in developing countries where pupils are learning through English Language as the medium of instruction (Peacock, 1995). Studies had shown that English as Second Language (ESL) learners encounter numerous problems learning science by having to simultaneously master both the science content and language at the same time (Rollnick, 1999; and William, 2001). Lemke (1997) reported that ESL learners have to immerse in two social practices together at the same time when learning science, one has to do with learning the language of science and the other which has to do with learning of new language (i.e. English).

Unfortunately, most teachers do not have the fortitude to take care of learners as second language learners. Referring to the problem of language of instruction in studying chemistry among the Nigerian secondary school students Adesoji (2005) noted that technical words are not well expressed or is not part of a student's oral vocabulary. Students may experience learning difficulties thereby leading to poor achievement in science. To support this, Udenwa and Ikonta (2008) in the evaluation of English language textbooks used in Lagos State junior secondary schools in Nigeria using Cloze tests, questionnaire and Flesch Reading Ease formula, the study showed that the texts materials used in Lagos State schools are difficult for the intended reader.

Studies have shown that many language used in science textbooks exceeds the normal experience of many school children (Yong, 2010). For example, Yong (2010) affirm that if the understanding of textbooks language is difficult for English speakers, it is likely to be even more difficult for students who learn science in a second language. The research conducted by Letsoalo (1996) and Doidge (1997) revealed that language used in some African science textbooks is too advanced for many of the pupils. The study further reported that the communicative competence of some Year 12 (17+ years) ESL students may be comparable to that of Year 5 (10+ years) English-speaking students. In

a similar studies, Heppner, Heppner, and Leong (1997) investigated the readability of Biology text materials and the reading ability of sixth form students (US 12th grade) in Brunei Durassalam and found that the reading materials supplied to the students were considerably more difficult than they were able to read comfortably.

A number of investigations have identified factors that can influence the ease or difficulty of text materials. For instance, Gunderson (1991) pointed out that text difficulty is determined by content features such as style (vocabulary and sentence structure), format and text organization, length of paragraphs, and intricacy of punctuation. Other factors according to Hittleman (1986) include illustration such as photographs, realist drawing, diagrams, charts and figures. In the analysis of the effects of illustrations on the readability of some junior school textbooks Newton (1983) showed that the use of illustrations with written textual materials can facilitate children learning to read. Finding the right fit between the difficulty level of the primary school science textbooks and pupils reading level have not been critically seen as a point of concern in Nigeria despite the fact that the textbooks are too difficult for pupils. It is important to monitor the suitability of these textbooks by subject teachers and publishers. Based on the scanty information on the difficulty level of primary school science and technology textbooks in Nigeria, it is imperative to carry out this study with the hope that the finding will provide important information on the difficulty level of the text materials.

Statement of the Problem

Science textbooks are the main sources for students to acquire scientific knowledge since they provide them with important situations in which learning takes place. Ayodele (2011) claimed that many students have not come across these textbooks before class; especially at the lower level of education where reading demands increase and readability of texts becomes more complex. Bean (1996) also claimed that many students are poor readers and may not be prepared to read at the level necessary to fully comprehend complex textbooks written in the language different from their mother language. These problems can result in poor comprehension in reading and subsequently affect academic achievement of students in science. As a result of the central position occupy by science textbooks in teaching and learning of science, it is important to determine the suitability or otherwise of these text materials in our primary schools with the hope that the findings of the study will reveal the suitability of the books for the intended users.

On the basis of these problems, the following questions were raised to guide the study.

1. What are the readability levels and reading age of the STAN Basic Science and Technology Textbooks?
2. To what extent do the STAN Basic Science and Technology Textbooks for Primary Schools suit the reading ability of the pupils?

Methodology

STAN Basic Science and Technology for Primary Schools Book 4 - 6, UBE Edition, written by the Science Teacher's Association of Nigeria (STAN) and published by University Press Plc, Ibadan was used for the study. Six Local Government Areas were selected from Ekiti State, Nigeria and two schools were randomly picked using stratified random sampling technique from each of the six Local Government Areas. A sample of 15 pupils from every school was randomly selected from primary 4, 5 and 6 in the selected schools. In all, a total of 270 pupils of classes 4, 5 and 6 were used for the study, comprising of 90 primary 4 pupils with an average age of 9 years, 90 primary 5 pupils with an average age of 10 years and 90 primary 6 pupils with an average of 11 years. Flesch-Kincaid Reading Ease Formula and Cloze Tests of Taylor (1956) were used as the major instruments.

The difficulty index of the textbooks was assessed using Flesch-Kincaid Reading Ease Formula. The formula involved chosen a sample of three 100-words, counting the number of sentence as well as syllables in each of the three 100-words. The passages selected for the study were *'Control of weed (weeding)' p.61; 'Soil and its constituents', p.94; and 'Building', pp.165-167 in book 4. 'Pollution', p.12; 'Environmental quality and human activities', p.32; and 'Forms of energy conservation', p.149 in book 5. 'The Earth's and gravitational pull', p.27; 'Weather records', p.53 and 'Human*

reproduction system', p.86 in book 6. The passages were selected from near, middle and towards the end of the textbooks and the Flesch-Kincaid Reading Ease Formula: FRE = 206.835 – (1.015 x ASL) - (84.6 x ASW) was applied the reading age of the pupils were also estimated for each of the books using the following formula: (L x 0.39) + (N x 11.8) – 10.59 years.

The Cloze test was used to assess the reading ability of the students. The technique according to Taylor (1956) involves ability of students to select appropriate words if occasional gaps occur in a passage based on their abilities to infer meaning from context. New passages of about 250 words which have not been taught by the teachers were selected in each of the textbooks and every 5th word was deleted from the passage, the first and the last sentence were left intact. The pupils were asked to insert the appropriate substitute or correct words for the 50 blank spaces in the passage. The tests were administered to pupils in primary 4, 5, and 6 during the normal class. To score the cloze passage, only the exact replacements were counted as correct answers. Spelling errors were not penalized. The raw score was the number of words that are correct; the correct numbers were double to find the percentage, that is, if there are 25 correct replacements, 25 x 2 = 50%. The interpretation shows that the materials are suitable for the pupils to read i.e. at instructional level.

Table 1: Students' reading level in relation to scores in the cloze test and suitability of the text material

Score	Reading level	Suitability of reading the materials
60-100%	Independent	Material is too easy for the pupils
40-59%	Instructional	Materials are suitable for pupils but need teachers' assistance
0-39%	Frustration	Materials are too difficult for the pupils

Source: (Wellington and Osborne, 2001)

Results and Discussion

Question 1: What are the readability levels and reading age of the STAN Basic Science and Technology textbooks?

In addressing this question, the readability scores and the reading age of the books as revealed by Flesch-Kincaid Formula were used and the results are tabulated below:

Table 2: Readability levels and the reading age of stan basic science and technology textbooks for primary school pupils

Textbooks	Readability levels	Reading age
Basic Science Book 4	39.31	12.3 years
Basic Science Book 5	21.00	13.6 years
Basic Science Book 6	48.65	14.2 years

On the application of Flesch-Kincaid readability formula on the *STAN Basic Science and Technology for Primary School book 4, 5, and 6,* the result showed that Flesch-Kincaid Reading Ease Score of 39.31 was obtained for book 4, 21.00 was obtained for book 5 and 48.65 was obtained for book 6. The formula also showed that the reading age obtained for each book was 12.3 years for book 4, 13.6 years for book 5 and 14.2 years was also obtained for book 6. Comparing the average age of pupils in primary 4, 5, and 6 with the calculated reading age of each book, data collected from the schools revealed that the average age of pupils in primary 4, 5 and 6 are 9 years, 10 years and 11 years respectively. The results suggest that many of the pupils will find it very difficult to comprehend the science concepts that 12.3 years, 13.6 years and 14.2 years are expected to understand.

Question 2: To what extent do the STAN Basic Science and Technology Textbooks actually suit the reading ability of the Pupils?

In addressing this question, the Cloze data of the three textbooks were used and the results are tabulated below:

Table 3: Percentage of pupils who read STAN Basic Science and Technology Textbooks materials at independent, instructional and frustration levels based on the scores obtained in the cloze test

Textbook	Cloze Reading Levels	Scores	Numbers of Pupils	Percentage
Book 4	Independent level	60-100%	15	16.66%
	Instructional Level	40-59%	25	27.77%
	Frustration Level	0-39%	50	55.55%
	Total		90	100%
Book 5	Independent level	60-100%	10	11.11%
	Instructional Level	40-59%	22	24.44%
	Frustration Level	0-39%	58	64.44%
	Total		90	100%
Book 6	Independent level	60-100%	16	17.77%
	Instructional Level	40-59%	34	37.77%
	Frustration Level	0-39%	40	44.44%
	Total		90	100%

From the findings reported in table 3 above, all the textbooks are extremely difficult for pupils understanding as revealed in the percentage of pupils experienced frustration in the course of reading the was higher. The table further showed that only 15 representing 16.66% of pupils can read *STAN Basic Science and Technology for Primary School Book 4* independently without teacher's assistance. 25 (27.77%) and 50 (55.55%) are categorized in instructional and frustration levels. This is an indication that the textbook is not suitable for the majority of the target pupils. The table also revealed that, 10 representing 11.11% of pupils can read *STAN Basic Science and Technology for Primary School Book 5* independently without teacher's assistance. 22 (24.44%) and 58 (64.44%) are categorized in instructional and frustration levels. This is an indication that the textbook is also difficult for the majority of the target pupils. It was also found that book 6 of the *STAN Basic Science and Technology for Primary School* is fairly difficult compared to other series as only 16 representing 17.77% could read the book independently, 34 representing 37.77% could read with teacher's assistance and 40 representing 44.44% at frustration level. From the findings reported in tables 2 and 3 above, all the series of the textbooks are not fitting for the level of the pupils under study.

Conclusion and Recommendations

Going by the report of this study, all the textbooks are somewhat difficult and far above the reading age of the target readers. It was also recorded that majority of the pupils in primary 4, 50 (55.55%) and primary 5, 58 (64.44%) and primary 6, 40 (44.44% are reading at a frustration level. By implication, the STAN basic science textbooks presented to primary, 4, 5 and 6 pupils are extremely difficult for them to understand. It is therefore recommended among other things that text materials to be presented to primary school pupils should be of appropriate type corresponding to the reading levels and reading age of the pupils for easy understanding, word length and density of syllables should also be reduce for easy comprehension, consequent upon this, textbook authors and publishers should be more aware of these problems before assigning such to any particular class.

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