Effects of Vigesimal and Decimal Modes on the Learning Outcomes of Junior Secondary School Students in Yoruba Numerals

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Abstract

Numeracy is an integral part of any language. For any linguistic discourse in a language to be meaningful, it should make reference to numbers. Yorùbá language employs vigesimal numerals of counting which involves complex calculation and had led various users to neglect its use. Despite scholars' efforts at finding lasting solution to this problem, learners are fast losing grip of the numerals. By way of contribution to solving the problem, this study examined the effects of vigesimal and decimal learning modes on students' learning outcomes in Yoruba numerals. A total of 180 Junior Secondary schools sixty students were randomly selected in one of the three selected secondary schools in Ijebu-Ode local government area for the study. Treatments were administered to the students. Vigesimal and decimal learning modes were administered to two experimental groups, students' previous knowledge on vigesimal numerals was considered for control group. Two research instruments were used namely: Yoruba numeral achievement test (r = 0.76), students' attitudinal questionnaire towards Yoruba numerals (r = 0.74). Analysis of covariance (ANCOVA) was used to analyse data at 0.05 significant level and Sidak post hoc analysis was used to explain the direction and source of obtained significant effects. The findings revealed that the main effects of treatments were significant both for vigesimal mode ($F_{(2, 161)} = 35.975$, $P < 0.05$) also decimal mode (LM= 16.128), There was significant main effect of treatment (learning mode) on students' attitude to Yoruba numerals ($F_{(2, 161)} = 3.824$, $P < 0.05$). The study concluded that Decimal

Yorùbá is an effective strategy in enhancing students' learning outcomes in Yorùbá numerals. It was therefore recommended that policy makers, curriculum planners and teachers should ensure its adoption into the school curriculums.

Key words: Vigesimal Yorùbá numerals, Decimal Yorùbá numerals, Learning outcomes.

Background to the study

Yorùbá numeracy is an important element of Yorùbá language. Yorùbá numerals belong to the grammatical structure of Yorùbá language because the nature of the components of numbers reveal that the cardinal numbers of Yorùbá convey quantity and the ordinal show the rank or position of numbers (Fabunmi, 2009 and Lapite, 2013). Numerals are one of the aspects of the day to day socio- economic and linguistic life of people. Learning of the Yorùbá numerals has its importance as its structure is used in everyday conversation. Babarinde (2013) explained that counting is an indispensable part of man. For the fact that every speech community has its own number of words used for counting attests to the claim that language permeates every aspect of human activity.

One of the aspects of Yorùbá Language identified as being so seriously endangered is its numerals system. Yorùbá language employs a vigesimal numeral structure where counting is done in multiples of twenty- (ogún), two hundred-(igba), two thousand-(ẹgbàá) and (twenty thousand – (ọ̀ké kan), (Kanday, 1987) which is too cumbersome and complex. For example, how does one convey to an average Yorùbá person on the 2014 Nigeria's annual budget presented by the Minister of Finance that Nigerian government spent 4.9 trillion in 2013, while proposing 4.6 trillion in 2014. Obviously it is a very difficult task with which uneducated Yorùbá person would be burdened. Finding a number equivalent to *256* will require a lot of mathematical task before arriving at the answer which is Ọtàlélúgba

ó dínmẹ́rin (60 + 200 – 4), while the numerals are called as they are written in English Decimal system, viz two hundred and fifty – six.

How could some educated people who attend church services be instructed to open the hymn book to page four hundred and forty - two without resorting to English language? Women folk too haggle every time at the market place to do their transaction with the sellers using the English counting system for bargaining of prices of goods. It is very obvious that this aspect of Yorùbá culture is almost forgotten, creating rooms for the second language counting system to supersede the indigenous language. As a result of the complexity the present speakers of the language most especially the teen-agers are dropping the language's vigesimal system of numerals for English decimal system of numerals (Fabunmi, 2010). The greatest problem is our inability to communicate effectively with one another in Yorùbá numeral system. It is highly cumbersome and requires mental calculation to be able to reckon numerals with even six figures. In short, Yorùbá numerals are almost forgotten by the speakers. Comrie (2006) claimed it to be shameful if Yoruba users can count in other languages like English and Arabic without a slight knowledge in Yoruba language. Woodbury (2003) observed that most of the traditional norms, values and attributes like counting system of African languages, most especially Yoruba language are fast fading away.

The world is in the digital age, where numbers are highly emphasized to be able to meet the global challenge of the digital era where counting, budgeting, numbering, operation of Automated Transmission Machine (A T M) /Master card pin code, account numbers, recharge cards and all bank transactions are number oriented. There is therefore need to find standard Yorùbá numerals which will be in consonance with English, the language which has the largest numbers of speakers in the world. This can be realized by changing the Yoruba numeral system from vigesimal to decimal

thus making the numerals to be globally accepted in day to day activities of people in terms of commerce, religion, politics and education. This can also create an avenue for Yorùbá numerals to be incorporated into computer in the nearest future. Soyoye and Lajuyigbe (1993) have this to say on their investigation of the native speakers on the numerals;

> The general tendency brought out by this study is that the Yorùbá speakers are fast losing grip with the numeral system of their mother tongue and that the 10-20 age group is more affected than the other age groups. The state of the knowledge of the Yorùbá numeral system by the native speakers can be explained by the fact that the Yorùbá prefer to use the English numeral system even when conversing in Yorùbá. This may be due to relative difficulty of the Yorùbá numeral system when compared to that of English. (pp. 69)

Since the usage of Yorùbá numerals has become a problem and the attitude of students towards the aspect of the language is at its lowest ebb, it is therefore, the duty of teachers, parents especially mothers and other stakeholders to redeem the situation; and arouse the interest of the learners in the acquisition of the Yorùbá numeral skills. This can be done by changing the vigesimal to decimal system and making use of Dice game to enhance the learning of Yorùbá numerals in basic schools.

Oyelaran (2008) and Longe (2009) also suggested a new method which he describes as a decimal system of numerals. It is observed that the system is far from reality, it appears to be more complex, examples are as follows; 60-Ẹ̀fàwá, 100- Òkangbáréjì, 1000-Òkan, while Adesanya (2006) stated that there is need for Yoruba decimal numeral which must be written as it is called and vice versa. Fakinlẹde (2004) also pointed out that if Yorùbá would be counted

as one of the major languages of the world, its complex numerical system would have to be simplified. Science and technology, the engines and machines that drive the modern world depend largely on number manipulations. This means that the system of performing rigorous mathematical mechanics before arriving at a given quantity has to change. The Vigesimal numeral system with which the ancient people counted their heads of cattle and cocoa bags would have to be replaced with the decimal system. The Vigesimal system would not move the Yorùbá language into the modern era. The examples of vigesimal and decimal numerals are stated thus:

Table 1: Vigesimal versus Decimal numerals

Figures	Vigesimal	Decimal
87	Ẹ̀ẹ̀tà dín ni Àádọ́rùn-ún	Ọgọ́rin ati eéje
116	Ẹ̀ẹ̀rìn dín lógóta	Ọgọ́rùn-ún ati ẹ́ẹ́fàlàá
242	Ojì lé lú gbá ó lé méjì	Ọgọ́rùn-ún méji, ogoji ati eéji
256	Òṭà lé lúgbá ó dín mẹ́rin	Ọgọ́rùn-ún méji, àádọ́ta ati ẹ́ẹ́fa
303	Ẹ̀ẹ́tà lé ní òó́dúnrún	Ọgọ́rùn-ún mẹ́ta ati ẹ́ẹ́ta
429	Okòó lé nírinwó ó dín mẹ̀sàn-án	Ọgọ́rùn-ún mẹ́rin, ogun ati ẹ́ẹ̀sàn-án
678	Òṛìn lé lẹ́gbẹ̀ta ó dín méjì	Ọgọ́rùn-ún mẹ́fà, àádọ́rin ati ẹ́ẹ́jo
920	Okòó lé lẹ́ẹ́dẹ́gbẹ̀rùn-ún	Ọgọ́rùn-ún mẹ̀sàn-án ati ogún

Statement of the Problem

In recent times, researchers have reported that the attitude of people, young and old, literate and non-literate, towards the learning of Yorùbá language is at the lowest ebb. Learners are fast losing grip of the Yorùbá numerals due to the system they adopt. To curb this trend, it is imperative of the language teachers to systematically bring about a strategy which is simple and does not require any mathematical task for learners to enhance the teaching and learning through the use

of decimal system of Yoruba numerals which is universally adopted. This study, therefore, investigated the effects of Yorùbá vigesimal and decimal numeral learning modes on the learning outcomes of Junior Secondary students in Yorùbá numerals.

Statement of Hypotheses

Hypotheses involving the treatment (two learning modes of numerals-vigesimal and decimal)

1. There is no significant main effect of treatment (learning mode) on students' achievement in Yorùbá numerals.
2. There is no significant main effect of treatment (learning mode) on students' attitude towards Yorùbá numerals attitude towards Yorùbá numerals**.**

Methodology

The design for this study adopted the pretest- posttest quasi experimental design using a 3x3x2 factorial matrix.

Population

The population for this study was made up of Junior Secondary students in three schools of
Ijebu-Ode local government area.

Sample and sampling procedure

Purposive sampling technique was used in selecting the three schools. The following criteria were considered for the eligibility of the schools out of which three schools were randomly selected;

(i) The secondary school must be government owned schools.
(ii) There must be at least one University graduate teacher of Yorùbá language and one English language teacher.

Instruments and Procedure

The first school was exposed to Vigesimal System of Yorùbá numerals (Experimental I) while the second school was exposed to Decimal system of Yorùbá numerals (Experimental II) and the third school was for control group using the conventional teaching strategy of Yorùbá vigesimal system. The pre-test and the post-test were at two levels for experimental groups one and two. The schools were distantly located from one another, to be sure that there was no interaction between the students from the selected schools.

(i) Yorùbá Numeral Achievement Test for Yorùbá Vigesimal and Decimal Systems (YNATYVDS).

(ii) Student's Attitudinal Questionnaire towards Yorùbá Numerals (SAQTYN). Were used.

Analysis of Results

Hypothesis 1: There is no significant main effect of treatment (learning mode) on students' achievement in Yorùbá numerals.

Table 1: Summary of Analysis of Covariance of Students' Achievement Scores According to Treatment, Vigesimal and Decimal numerals

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig. of F
Main Effects	**609.669**	**1**	**609.669**	**55.153**	**.000**
Covariates (pre-test)	761.903	1	761.903	68.925	.000
Treatment (learning mode)	795.353	2	397.676	35.975	.000*

In order to trace the source of the significant difference obtained in table 1, the Sidak post-hoc analysis was carried out and the summary is presented in table 3.

Table 2 :Sidak Pair-wise Comparisons of Students' Achievement

Scores on Treatment Groups

Mean	Treatment –Learning Mode	Exp. Group1	Exp. Group2	Control Group
9.037	**Experimental Group1**		*	
14.999	**Experimental Group2**	*		*
7.998	**Control Group**		*	

* denotes pairs of groups that are significantly different at $P < 0.05$

The results in table 1 revealed that the obtained significant difference in the achievement scores of the students exposed to the different treatment groups was due to the significant difference in the post-test mean achievement scores of the participants in experimental group 1 and experimental group 2 on one hand and experimental group 2 and control group on the other. That is, the difference between the post-test mean achievement scores of the students in experimental group 1 and experimental group 2 as well as experimental group 2 and control group are statistically significant at the .05 level.

Hypothesis 2: There is no significant main effect of treatment (learning mode) on students 'attitude towards Yorùbá numerals. This hypothesis was tested based on the summary of Analysis of Covariance results presented below:

Table 3: Summary of Analysis of Covariance of Students' *Attitude Scores According to Treatment: vigesimal and decimal numerals*

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig. of F
Main Effects	**7986.741**	**1**	**7986.741**	**97.316**	**.000**
Covariates (pre-test)	1188.238	1	1188.238	14.478	.000
Treatment (learning mode)	627.702	2	313.851	3.824	.024*

The results in table 3 revealed the main effect of treatment (i.e.

learning mode) on the students' attitude scores towards Yorùbá numerals. The result showed that there is significant main effect of treatment on the students' attitude scores ($F_{(2, 161)} = 3.824$, $P < 0.05$). The results implied that the post-test mean attitude scores of the students exposed to the different learning modes are significantly different. Therefore, the null hypothesis one (2b) is rejected.

The results of the multiple classification analysis (MCA) presented in table below however revealed the magnitudes of the post-test mean attitude scores of the participants according to learning modes. The MCA in table 4 is necessary to determine the best of the three learning modes used in the study with respect to improving students' attitude towards Yorùbá numerals.

Table 4: Multiple Classification Analysis of Students' Attitude

The results in table 4 revealed the magnitudes of the adjusted post-test mean attitude scores of students exposed to the three learning modes. The MCA revealed that with a grand mean of 79.267, the students in the experimental group 1 recorded the highest adjusted post-test mean attitude score of 84.807 (i.e. 79.267 + 5.54). The students exposed to the conventional method recorded the next higher adjusted post-test mean attitude score of 81.427 (i.e. 79.267 + 2.16) while the students in the experimental group 2 recorded the least adjusted post-test mean attitude score of 79.337 (i.e. 79.267 + 0.07). This outcome thus revealed that the learning mode used as treatment in the first experimental group recorded the best post-test mean attitude score and so had the best effect on the students' attitude towards Yorùbá numerals.

The results in table 4 further revealed that while treatment alone accounted for 4.84% $(0.22)^2$ of the variance in the students' attitude scores, the independent and moderator variables jointly accounted for 24.30% $(0.493)^2$ of the variance in the students' attitude scores.

In order to trace the source of the significant difference obtained

in table 4, the Sidak post-hoc analysis was carried out and the summary is presented in table 2.2.

Table 5: Sidak Pair-wise Comparisons of Students' Attitude Scores on Treatment Groups

Mean	Treatment Strategy	Exp. Group1	Exp. Group2	Control Group
82.062	**Experimental Group1**		*	
76.982	**Experimental Group2**	*		
78.756	**Control Group**			

* denotes pairs of groups that are significantly different at $P < 0.05$

The results in table 5 revealed that the obtained significant difference in the main effect of treatment (learning mode) was due to the significant difference in the post-test mean attitude scores of the students in the experimental group 1 and experimental group 2 only. That is, the difference between the post-test mean attitude scores of the students in experimental group 1 and experimental group 2 are statistically significant at the .05 level. However, there was no significant difference in the post-test mean attitude scores of the pairs of students exposed to experimental treatment 1 and conventional method as well as experimental treatment 2 and conventional method.

Discussion

The main effect of treatment (learning modes) on students' achievement in Yorùbá numerals aimed at finding out whether the two learning modes of Yorùbá numerals: vigesimal and decimal would have significant differences in the achievement scores of students exposed to them. The data revealed that the learning mode of decimal system of Yorùbá numerals is more effective. The Yorùbá decimal numeral group had the highest adjusted post-test mean

score of 16.128 while the vigesimal numeral group had the higher adjusted post-test mean score of 10.678. The control group that was tested based on the previous knowledge of vigesimal system which had been taught by teachers before had the least adjusted posttest mean score of 8.958. This means that students would have the best achievement scores if the learning mode of decimal system of Yorùbá numerals is implied.

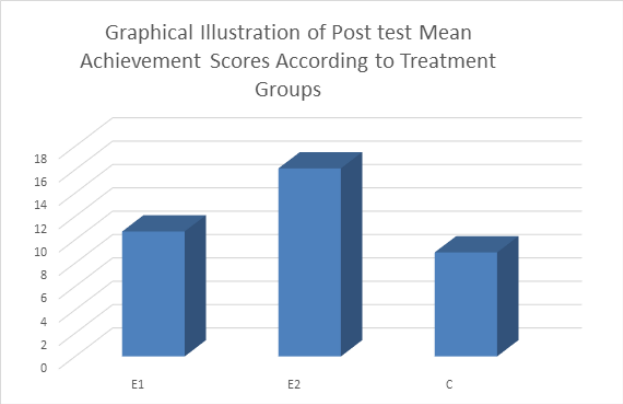

Fig 1: E1 = Experimental group 1 (vigesimal), E2 = Experimental group 2 (decimal)
C = Control group (vigesimal – previous knowledge).

The possible reasons for the significant difference in the achievement scores of the vigesimal and decimal and the conventional vigesimal is due to the fact that the students found the vigesimal system of Yorùbá numerals very difficult and hence affecting their performance while the decimal system of Yorùbá numerals had a high performance.
The findings are in agreement with the submission of Olutoye (1981), Bamgbose (1986), Awobuluyi (1978), Ọmọle (1997), Fakinlẹde, (2004),Adeyinka, (2005), Adesanya (2006) and Longẹ (2009) that the vigesimal system of Yorùbá numeral is complex and cumbersome and that there is need for decimal system of Yorùbá

numeral which is easy to calculate and in consonance with the global world and later be incorporated into the computer in future.

The main effect of treatment (learning modes) on students' attitude to Yorùbá numerals revealed that the vigesimal numeral group and control group recorded the highest adjusted posttest mean attitude of 84.807 and the control group 81.427 while the students in the decimal group recorded the least adjusted posttest mean attitude score of 79.337. This outcome reveals that the experimental group 1 and the control group expressed their negative attitude to the questionnaire, thus responded in agreement to the fact that vigesimal numerals are very difficult while the other group of decimal system of Yorùbá numerals based on the system they were exposed to did not see any difficulty in the decimal system of Yorùbá numerals thus expressing their positive attitude toward the decimal system of Yorùbá numerals. It was also observed that many teachers did not make an attempt to teach Yorùbá numerals despite its inclusion in the school curriculum hence, emphasis is only placed on English numerals.

The findings support the views of Awobuluyi, (1978), Akinbọte and Viatonu, (1996), Adeyinka, (2005), Fabunmi and Salawu, (2005) that there should be a replacement of Yorùbá numerals from vigesimal to decimal system for learners to have positive learning attitude towards the learning of Yorùbá numerals. Learners' attitude towards the learning of Yorùbá numerals is presently negative because of the complexity of the vigesimal system which Yorùbá adopted. Once the vigesimal is replaced by the decimal system of Yorùbá numerals, this might arouse the interest of the learners thus affecting their attitude positively.

Conclusion

The study has provided meaningful insight and solution as regards to how Yorùbá numerals can be incorporated into digital age of global

world. This can be through the replacement of vigesimal system of Yorùbá numerals with decimal system of Yorùbá numerals and as such cater for many digits of figures, and the counting system will no more be too cumbersome and complex.

Based on the findings of this study, the researcher had to come up with the following conclusion;

- Vigesimal system of Yorùbá numerals needs replacement because it is complex and cumbersome.
- The only way out of the present difficult and precarious state of Yorùbá numerals especially during this digital age is to adopt the suggested decimal numeral system which will eventually be accepted by the global world and be incorporated into computer in the nearest future.

Recommendations

The following recommendations are presented.

- The researcher should write a proposal to the Nigerian Educational Research and Development Council (NERDC) and State Universal Basic Education Board (SUBEB) that conferences and workshops should be organised on the use of the recommended decimal system of Yorùbá numerals to alleviate the problem of counting, thus making the learning of Yorùbá numerals easier.

- Text books and other relevant instructional materials should be developed on the suggested decimal Yorùbá numerals which would serve as references to local, national and international world for Yorùbá numerals to be accepted globally.
- There should be curriculum reform and curriculum planners must plan pragmatic and dynamic curriculum contents which will be in consonance with the global world especially in terms of numerals.

- NERDC in collaboration with TETFUND should include the Yoruba Decimal numerals in the curriculum of tertiary institutions of learning (Colleges of Educations and Universities) and provide the necessary materials.

References

Adesanya, A. (2006). The Yorùbá Decimal system: paving the way for Yorùbá people to a modern, scientific world- *Yorùbá Affairs* http://groups.com/Yorùbáaffairs/

Adeyinka, A. A. (2005). Effects of Two Numerical Systems on Students' Achievement in, and Attitude to, Yoruba Numerals. A *Ph.D*. Thesis in the Department of Teacher Education, Faculty of Education, University of Ibadan, Ibadan. 83 - 124.

Akinbote, O.O, & Viatonu, O (1996).Parents' characteristics and attitude towards the use of Mother-tongue as a medium of Instruction in primary Schools. *Beagle*, *Journal of Lagos State College of Education,* Epe, vol. 1.1&2.

Awobuluyi, O. (1978). *Essentials of Yorùbá Grammar*. Ibadan. Oxford University Press Ibadan. 314-340.

Babarinde, O. (2013). The Linguistic Analysis of the Yoruba Numerals. *Journal of literature and Linguistics: An Open Access International Journal*,vol.1. 78-87.

Bamgbose, A. (1986). *Yoruba: A Language in Transition.* In J. F. Odunjo Memorial Lectures Series NO, 1. Lagos. J.F. Memorial Lecture Organising Committee. 36.

Comrie, B (2006). *Endangered Numeral Systems*. Paper presented at Max Planck Institute for Evolutionary Anthropology.

Fabunmi, F.A & Salawu, A.S. (2005). Is Yorùbá an Endangered Language? *Nordic Journal of African Studies.*14(3): 391-408. Nigeria.

Fabunmi, F.A. (2009). *A Grammatical Analysis of Morphology Dialect of Yorùbá*. Plumstead, Cape Town, South Africa. pp 55.

Fabunmi, F.A. (2010). Vigesimal Numerals on Ifę (Togo) and Ifę (Nigeria); Dialects of Yoruba. *Linguistic online*, 43.3/2010.

Fakinlęde, K.J, (2004). Yorùbá Numeral system. *Yorùbá Affairs*http://groups.google.com/d/msg/yorubaaffairs/

Kanday S.A (1987).English in Suppressive interference.*Studies in EnglishLanguage* I (1&2): 5-13.

Lapite, A. (2013).Yoruba Numeration and Number System. *Afropede; Abiyamo*. Prentice Hall. May 20, 2013. http//sites.google.com/site/afropedia/Yoruba-numeration-number-system.

Longe, O. (2009a). *Eto Onka Yorùbá Onipele Mewaa mewaa Lede Yorùbá. A YorùbáDecimal Number System*. Published by Book Builders, Bodija, Ibadan: 9 & 29.

Longe, O. (2009b*). Eto Onka Yorùbá Onipele Ogoogun Lede Yorùbá.* TheYorùbá Vigesimal Number System.Published by Book Builders Editions Africa, Ibadan: 52 & 53.

Omole, K.(1997). *Arithmetic Operation in Yoruba Numerals Ideas*.1 (1). Lagos: Glendora International Nigeria Limited.

Olutoye, O. (1981). OnkaYorubá ati Ilosíwájú Orílè Ede wa in *Yorùbá Gbòde*No.6, August 981.

Oyelaran, O. (1980). Yoruba Chapter in Federal Ministry of Education. A Glossary of Technical Terminology for Primary Schools in Nigeria (Trial Edition). Lagos. 207 – 266.

Soyoye, F.A &Lajuyigbe, A.O. (1993). Numerals in Yorùbá: *An* Investigation of Native Speakers' knowledge of a language sub-system. *Research in Yorùbá Language and Literature*.

No.4, May, 1993. 68-77.

Woodbury, T. (2003). Defining documentary linguistics .In P.K. Austic (Ed.) *Language documentation and description.* Vol.1. 35 – 51.