FOSTERING THE TEACHING AND LEARNING OF MATHEMATICS IN JUNIOR SECONDARY SCHOOLS THROUGH ETHNO-MATHEMATICS IN ABIA STATE NIGERIA

BY

NNENNA K. UKA (Ph.D) . DR SUSSAN IJEOMA EZEH

Department of Science Education,College of Education Michael Okpara University of Agriculture , Umudike, Abia State nnekaluuka@yahoo.com

Abstract

This study tried to discuss Mathematics and its usefulness to society. It tried to look at Ethnomathematics is culture based and useful in teaching and learning mathematics at the junior secondary schools in Abia State. A survey research design was adopted for this study since the opinions of respondents were sought. The target population was all the mathematics teachers in the Public Secondary Schools in Abia State numbering 267. The sample for this study consists of 200 mathematics teachers who were randomly drawn from the population through a simple random sampling technique. A 20-item questionnaire tagged "Mathematics Teachers Questionnaire (MTQ) was used for the study. Three research questions were posed and answered. The instrument was validated by two experts, one in Measurement and Evaluation and the other in Mathematics Education. A four-point rating scale of very high extent(VHE), high extent(HE), low extent(LE) and very low extent(VLE) was used to answer research question 2 while Strongly Agree (SA), Agree (A), Disagree(D) and Strongly Disagree (SD) was used to answer research questions 1 . A total of 200 MTQ were administered to the respondents by the researchers and the same were collected. Data collected were analyzed using mean and standard deviation. The findings indicated that there are many ways Ethnomathematics can be used in the teaching and learning of mathematics, some of which are the use of body parts, cultural games, dances and farming. Ethnomathematics is really needed in the teaching of mathematics because it influences the teaching and learning of mathematics to a high extent and fosters the learning of mathematics. It was recommended that ethnomathematics should be encouraged in schools as it fosters the teaching and learning of mathematics

.

Keywords; Ethnomathematics, Culture, fostering.teaching and learning, mathematics

Introduction

Mathematics is needed in every facet of life and at all levels. Mathematics education plays a vital role in the making of any student in his/her chosen field of study. It is of everyday use to both the educated and uneducated in all nooks and crannies of the earth. Housewives, traders, farmers, tailors, doctors, engineers, clerks and people of all trades and professions need to apply some level of knowledge of mathematics every minute of their lives. The importance of mathematics need not be over-emphasized. It is a basic tool in the development of science, technology, commerce and industry and hence in the economic development of a modern society. Enukoha, Umonyang. Uka and Ekwueme (2006) opined that entry into many careers today depends on the amount of mathematics studied in school.

The Nigerian government has realized the importance of mathematics and that is why mathematics in the National policy on Education (FRN, 2013), is one of the core and compulsory subjects of the primary, junior and senior secondary school curriculum. This importance accorded mathematics in the school curriculum reflects accurately the recognition of the vital role it plays in contemporary society, especially when the broad aims of secondary education within our overall national objectives is the preparation for useful living within the society.

For the secondary and higher school aim of mathematics to be actualized, it must start with primary pupils and junior secondary students. This must be done in order to provide young students with the right kind of intervention and experience in their early years so that they will not be deprived of some very vital cognitive growth opportunities. It is during their early years that young children begin to lay down those habits of reasoning upon which later achievements in mathematics will crucially depend.
Mathematics is one way to make sense out of things. Mathematics is the key to opportunity. No longer just the language of science, mathematics now contributes in direct and fundamental ways to business, finance, health and defense.

The National Policy on Education (FRN, 2013) recognizes the need to develop numerical and scientific literacy among the young people by stipulating the general objectives of primary and junior secondary education to include;
i) The inculcation of permanent literacy and numeracy, and the ability to communicate effectively.
ii) The laying of the sound basis for scientific and reflective thinking.
In deed no nation can achieve permanent numeracy and scientific thinking without mathematics.

Despite all these numerous roles mathematics plays in life and society, the failure rate every year is so alarming. Many researchers have identified teacher factor among others as leading to poor performance in mathematics.

(Enukoha in Uka (2006) ; Obodo in Uka (2006); WAEC Chief Examiners' reports 2002, 2007, 2012,2017,2020, 2021; Anderson,2013;Umar,Tudunkaya and Muawiya,2019), yet there is not much improvement.

The poor performance could be traced to poor foundation laid at the early stage, which is the foundation of any education system. The poor performance in the foundational level invariably will affect other levels. The deplorable condition is high and there is evidence that this poor performance is as a result of non-utilization of appropriate teaching approaches in mathematics as the method is foreign and fails to consider the cultural background of the learner (Kurumeh, 2007, Fakayode in Umar et al, 2019).

One of the objectives of mathematics education stated by Enukoha in Uka (2006) is for the students to understand how mathematics as a science and as an art contributes to our cultural heritage. There is then the need to consider the knowledge of this aspect of mathematics that has a link to one's culture known as "Ethnomathematics"

Ethnomathematics was a coined term first introduced in 1985 by a Brazilian mathematics educator, Ubiratan D'Ambrosio. Ethno simply refers to "cultural context" while mathema refers "to explain" , "to know" or " to understand" and tics has to do with technic which is rooted in art and techniques. D'Ambrosio(2001) opined that the term " ethno" describes all of the ingredients that make up the cultural identity of group such as languages, codes , values, beliefs, food and dresses, habits and physical traits. He also said that , " ethno"refers to races, tribes or group of relatives,"mathema" is the actions of explaining and understanding in order to survive while the word "tics" refers to techniques such as counting, measuring, ordering , sorting, classifying, inferring and modeling.

According to Davison in Umar et al (2019), ethnomathematics is the art or technique explaining, knowing and understanding diverse cultural contexts. Rosa and Orey (2011), opined that ethnomathematics can present mathematical concepts of the school curriculum in such a way that they are related to students' cultural and daily experiences, whereby enhancing meaningful connections and deepening their understanding in mathematics. They supported that ethnomathematics uses cultural experiences as vehicles to make mathematics learning more meaningful and to provide students with the insights of mathematical knowledge as embedded in their social and cultural environment.

Ethnomathematics takes care of the child's culture in teaching and learning of mathematics. This has made teaching and learning meaningful in mathematics (Enukoha in Uka, 2006). For instance, the 'okoso' game or top, could be used to gain insight into geometry and physics thereby, affording the child and teacher an opportunity for interdisplinary discussion.

Ethnomathematics has been seen as a discipline interested in the study of mathematics and mathematics education in the cultural millieu of the learners (Zaslavsky; Enukoha; in Uka, 2006).Ethnomathematics actually has made mathematics to be the product of different cultures (D'Ambroisio in Anderson, 2013).

Ethnomathematical knowledge allows a teacher to bring the world into the classroom by making use of things in the environment to teach mathematics, examples; hoes, body parts like fingers, toes, foot. The ethnomathematical knowledge agrees with the principles of learning from known to unknown. If a teacher is conversant with the mathematical activities of the community, the mathematics taught in the classroom can easily be understood and effective classrooms for students encourage high level of peer interaction, group decision-making, and of course high participation, which leads to high performance (Enukoha, Umoinyang,Uka & Ekwueme,2006).

Kurumeh (2007) opined that in Ethnomathematics Approach classroom, the learner draws from the past experience and cultural background before the new knowledge is introduced giving room for negotiation and interpretation between teacher and students. The teacher explores the cultural experience of the learner to teach mathematics thereby making it understandable and meaningful to the learners.

Statement of Problem

The cry over students' poor performance in mathematics in Nigerian education system has continued and the teachers, parents, government and the general public have been concerned and expressed much concern. This situation starts affecting the early education experience of children. Once the early education is affected, other levels of education invariably will be affected. This condition is deplorably high and there is evidence that poor performance is as a result of non-utilization of appropriate teaching approaches and inability to interpret the questions appropriately as a result of language. Many methods of teaching mathematics have been discussed, yet, the poor performance could not be reversed There is then the need to consider this approach of teaching mathematics that deals with the students' environment, language and culture; ethnomathematics.

Saddiq (2020) opined that mother tongue is the child's first language that could enable the child understand mathematics better, but unfortunately the use of mother tongue in our primary schools have not been encouraging. Some schools even forbid the use of mother tongue even when it is known that students learn from known to unknown, from concrete to abstract. WAEC Chief examiners' report (2019), indicated that students performed poorly in word problems as a result of not being able to understand the language and interpret from words to symbols correctly. This boils down to indicate that if children are taught in their local language and with their culture and things they see around them, it will enhance the performance of students in mathematics. It is against this back lock that this study seeks to investigate the influence of ethnomathematics in fostering the teaching and learning of mathematics in Abia State.

Research Questions

The following research questions were asked for this study.

1. In what ways can ethnomathematics be used in the teaching and learning of mathematics?

2. To what extent does the use of ethnomathematics influence the teaching and learning of mathematics?

Methodology

A survey research design was adopted for this study since the opinions of respondents were sought. The target population for this study was all the mathematics teachers in the Public secondary Schools in Abia State numbering 267.The sample for this study consists of 200 mathematics teachers who were randomly drawn from the population through simple random sampling technique. Questionnaire tagged "Mathematics Teachers Questionnaire (MTQ), made up of 20 items. The instrument was validated by two experts, one in Measurement and Evaluation and the other in Mathematics Education. A four- point rating scale of very high extent(VHE), high extent(HE), low extent(LE) and very low extent(VLE) was used to answer research question 2 while strongly Agree (SA), Agree (A), Disagree(D) and Strongly Disagree (SD) was used to answer research questions 1. A total of 200 MTQ were administered to the respondents by the researchers and same were collected back after respondents have filled them. Data collected were analyzed using mean and standard deviation.

For decision taking on the research questions, research question 2 used the real limit value of 4.00-3.50(VHE), 3.49-2.50 (HE), 2.49 -1.50 (LE) 1.49-1.00 (VLE) while research question 1 used weighting ranging from 4 to 1 for positively cued items and vice versa for negatively cued items. Any item that is positively worded which has a mean score of 2.5 and above is taken as agreed while for the negatively worded items the reverse is the case.

Results

Research Question One:

Table1: Mean and Standard Deviation Scores of Respondents' Opinion on the ways ethno-mathematics can be used in the teaching and learning of Mathematics.

S/N	ITEMS	MEAN	STD DEV.	DECISION
1	The use of paired body members, hands, ears,eyes and legs can be used in teaching even and odd numbers	3.02	.83	Agreed
2	My students understand counting better when part of the body like fingers, toes are used	2.88	.89	Agreed

3	Measurement of length or distance is easy to understand using man's foot	2.94	.72	Agreed
4	When cultural dance is used to teach mathematics, students understand better	3.25	.63	Agreed
5	Students can do well in mathematics without using any object or cultural activities	2.38	.94	Agreed
6	Cultural games are veritable instruments in teaching and learning of mathematics	3.08	.90	Agreed
7	Hoes can be used in teaching angles	3.32	.58	Agreed
8	The roof of a round house/villiage round hut is used in teaching circle	3.25	.62	Agreed
9	Counting gestures like market week is used in teaching addition, multiplication and proportion	2.58	,87	Agreed
	Grand mean	2.93		

From table 1, it could be observed that items 1,2,3,4,6,7,8,9,10 had means 3.02, 2.88, 2.94, 3.25, 3.08, 3.32, 3.25, 2.58 and 2.55 respectively which were above the cut-off point of 2.5 and so were agreed upon. But item 5 had a mean of 2.38 and was disagreed upon. All these indicated ways ethnomathematics can be used in teaching and learning of mathematics.

Table 2; Mean and standard deviation scores of respondents on the extent to which Ethno mathematics could influence the teaching and learning of mathematics.

S/N	ITEMS	MEAN	STD DEV.	DECISION
10	Ethnomathematics makes my teaching interesting			
11	Ethnomathematics aids my teaching in mathematics	3.23	.65	High Extent

12	My students perform better when I use ethnomathematics approach	3/47	.78	High extent
13	In ethnomathimatics, the learner engages the teacher in discussion	2.75	.89	High extent
14	Ethnomathematics makes teaching and learning meaningful	2.91	.72	High extent
15	Ethnomathematics helps learners to become mathematically powerful thinkers and problem solvers	2.68	.90	High extent
16	Ethnomatimatics a cultural way of solving problems	2.88	89	High extent
17	When cultural dance is used to teach mathematics, students understand better	2.90	.77	High extent
18	Ethnomathematics facilities learning and memory retention	2.95	.69	High extent
19	Mathematics is interesting when culturasl games are used to teach it	3.05	.90	High extent
20	Mathematics is understood easier and better when objects familiar to students are used in teaching	3.48	.68	High extent
	Cumulative Mean	3.03		

From Table 2, Items 11 to 20 have means above the cut-off point of 2.5 indicating that ethnomathematics influences the teaching of mathematics to a high extent. This was indicated by the opinions of teachers on the influence of ethnomathematics on the teaching and learning of mathematics.

Findings

1. There are many ways Ethnomathematics can be used in the teaching and learning of mathematics. These include; use of body parts, cultural games and dances, farming implements like hoes, houses/huts, traditional objects like baskets, mats, pots etc, just to mention but a few.

2. Ethnomathematics is really needed in the teaching of mathematics because it influences the teaching and learning of mathematics to a high extent. It fosters the learning of mathematics.

3 The cultural activities / objects of the environment play a vital role in the teaching and learning of mathematics.

Discussion of Findings

The data on table1 shows many ways ethnomathematics can be used in the teaching and learning of mathematics. By using what is within and around the child makes mathematics interesting and easier to understand. This is in agreement with the opinion of Enukoha in Uka (2006) which says that ethnomathematics has made mathematics teaching and learning meaningful.

The study, from table 2 also reveal that the cultural environment of the child plays a vital role in his learning in generally and in mathematics in particular. It influences the teaching and learning of mathematic positively, thereby fostering it.
This is in agreement to D'Ambrosio in Anderson(2013) who noted that with ethnomathematics, mathematics becomes the product of all cultures.
It is true that using cultural activities / objects of the learner enhances the teaching and learning of mathematics, from table 1, items 9 and 10, with mean of 2.58 and 2.55 respectively, it can be deduced that some of these cultural initiatives objects many not be adequately mastered / known by the teacher.

CONCLUSION

This study revealed that ethnomathematics is very pivotal in the teaching and learning of mathematics. The cultural environmental activities/objects of the learner cannot be neglected as it aids immensely in the learning of mathematics.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made.
1. Ethnomathematics should be inculcated in the school curriculum and should be encouraged in schools as it fosters teaching and learning of mathematics.

2. Parents should teach ethnomathematics concept from home.

REFERENCES

Anderson,P.K(2013). Ethnomathematcs: The Role of Culture in the Teaching and Learning of
Mathematics. 52 Utah Mathematics Teacher Fall/ Winter 2013-2014

Balamurugan,M.(2015). Ethnomathematics: An Approach for Learning Mathematics from Multicultural Perspectives. *International Journal of Modern Research and Reviews 3(6),*
716-720

D'Ambrosio,U(2001).What is Ethno-mathematics and How can it Help Children in Teaching
Children Mathematics. In V.T Beston (Ed). National Council of Teachers of Mathematics,
NCTM

Enukoha, O.I, Umoinyang I. E, Uka, N.K, & Ekwueme C. (2006).Ethnomathematical knowledge
of teachers and Primary School Pupils' Performance in Mathematics. Paper presented at
the African Conference on Primary / Basic Education University of Botswana. October 16th – 19th 2006.

Federal Republic of Nigeria (2013), The National Policy on Education Lagos, NERDC.

Kurumeh, M.S.(2007) Effect of Ethno,athematics Approach on Students Interest in Geometry
And Mensuration.*Journal of the Mathematical Association of Nigeria, 32(1) 103-114.*

Rosa, M.& Orey, D.C(2011). Ethno-mathematics: The Cultural Aspect of Mathematics. Revista
Latinoamericana de Etno-mathematica, 4(2), 32-54.

Saddiq, K. (2020). Mother tongue nas an essential tool for improving basic schools pupils performance in elementary mathematics in oyio, Nigeria. *Journal of the Mathematical*
Association of Nigeria, 45(1) 131-139

Uka, N. K (2000), Teachers Mathematical attitude, ethnomathematical Knowledge and Primary School Pupils academics achievement in Mathematics in Abia State – Nigeria. Unpublished Ph.D dissertation.Faculty of Education, University of Calabar Nigeria.

Umar,I.O, Tudunkaya,M.S &Muawiya, H.U(2019). Effect of Ethno-mathematics Teaching Approach on Performance and Retention in Trignometry Among Secondary School Students in Zaria local Govrnment Area Kaduna State, Nigeria. Abacus: The Journal of Mathematical Association of Nigeria 44(1), 104-112

WAEC Chief Examiner's Report in Mathematics (2002). Chief Examiner's Report, Lagos ; WAEC.

WAEC Chief Examiner's Report in Mathematics (2007). Chief examiner's Report. Lagos; WAEC

WAEC Chief Examiner's Report in Mathematics (2012). Chief examiner's Report. Lagos; WAEC

WAEC Chief Examiner's Report in Mathematics (2017). Chief examiner's Report. Lagos; WAEC

WAEC Chief Examiner's Report in Mathematics (2020). Chief examiner's Report. Lagos; WAEC

Zaslavsky, C. (1987). Maths Come Alive Activity from many cultures. Portland, Marine, J. Western Watch.

S/N	Items	$\bar{X}$	SD	Decision

11	
12	
13.	
14.	
15	
Cumulative Mean	3.18
