

Ethnomathematics: A Reflection of Culture and Tradition

¹Emmanuel Asuquo Edoho, Ph.D
edohoemmanuel@yahoo.com

¹Onun Okoi Ibiang
*¹Department of Science Education
Faculty of Education
University of Calabar, Calabar*

Abstract

This paper x-rayed the field of ethnomathematics as a true reflection of culture. It considers ethnomathematical activities within the cultural diversity of the people. This is aimed at mirroring some cultures within the society in order to improve the culture and to see how it affects the educational system, especially the learning of mathematics. This subject matter was examined under the following headings: counting, the historicity of ancient mathematics, number symbolism and mysticism, the concept of time and record keeping, measurement, the Bakor experience. Ethnomathematics as a culture-based mathematics and a remedy to the problem posed by western mathematics within our school settings has been extensively discussed. It was concluded that ethnomathematical concepts help to improve the methods of teaching school mathematics; teachers of mathematics are therefore encouraged to incorporate the concepts in their teaching approaches.

Keywords: Ethnomathematics, Culture, Tradition

Introduction

The importance of mathematics cannot be over emphasized because of its usefulness to human and societal development. Learners of mathematics perceive mathematics to be an abstract and a dreaded subject. Not only that, they equally develop hatred for it owing to the fact that, it is perceived to be a difficult subject (Enukoha, Meremikwu & Ekweme, 2007). This misconception and notion held by learners of mathematics has given the teachers of mathematics great concern. In a quest to see how this misconception, as held by learners of mathematics, can be disabused, scholars of mathematics came up with the concept of ethnomathematics, which is the integration of culturally acquired mathematical skills in the teaching and learning of school mathematics.

Ethnomathematics is the mathematics practiced by an identifiable cultural group (D'Ambrosio, 1997). It is also seen to be unwritten or oral literacy (Enukoha, 1979). Perhaps, this is aimed at relating the daily activities engaged in by students at home to

teaching and learning of mathematics in school. This paper seeks to emphasize on the need and essence of ethnomathematics as a reflection of culture. In this work, critical examination is made of the following ethnomathematical concepts: Counting, Number symbolism and mysticism, Time and record keeping and measurement. While this paper makes its own justification, the opinions of various scholars will be considered.

Ethnomathematics: a true reflection of culture and tradition

The place of ethnomathematics in reflecting culture and tradition from the view of various scholars is also highlighted. This will be discussed on the headings listed in the introduction.

Counting: The historicity of ancient mathematics

Gay and Cole in Eukoha (2010) wrote about counting among the Kpelle of Liberia. They maintained that there are few occasions for counting beyond approximately 30 or 40. They further observed that a young man who spoke Kpelle as his native language and had been through three years of school and was at least of normal intelligence could not remember the Kpelle terms for such numbers as 73 or 238. It may be the case that if Gay and Cole had used unschooled adults, they might have obtained a different result. The reason being that, generally, unschooled adults are more proficient in their native languages than schooled adults. According to him, school adults often suffer from foreign cultural interference. Unlike what Gay and Cole found among the Kpelle of Liberia, namely, that there were few occasions for counting beyond 30 or 40, Eukoha (1995) found that among the unschooled Igbo adults, counting was up to 400 and the number word for 400 was ‘nnu.’ There were no number words beyond “nnu” until the late F. C. Ogbalu and his associates developed other numbers such as nari – 100, puku – 1000, nde - 100,000 and njeri - 1,000,000.

Ohuche (1975) found that the Limba of Sierra Leone, like the Kpelle of Liberia, had a decimal counting system within which was submerged a sub-base five system. The author further observed that the two largest ethnic groups – Mende and Temne used a “toes and fingers” counting system which clearly grouped objects into twenties. Writing on the Igbo numeration system, Zaslavsky (1973) argued that this system was based on twenty and that whether five or ten was also the base was not apparent. In an attempt to justify this claim, the author quoted Cajori (1896) who had observed that:

Of the notations based on the human anatomy, the quinary and vigesimal systems are frequent among the lower races, while the higher nations have usually avoided the one as too scanty and the other as too cumbersome, preferring the intermediate decimal system. The quinary and vigesimal systems are common in Africa.

This is a typical examples of Eurocentrism in which Europeans claim to have discovered all mathematics. In all cultures including Europeans culture, mathematics

started with numbers and these numbers were based on human anatomy. Among the Igbos the quinary, vigesimal and decimal systems are used simultaneously, the experience is that as the culture developed, mathematicians found that the decimal system was more convenient in all mathematical transactions and this became prominently used in all societies.

Enukoha (2010) argued that Gay and Cole were not right about the Kpelle system of counting. But in the course of reviewing the Igbo counting method he ended up at 1,000,000. Which implies that the Igbos do not have name for 1,000,000,000. The fact is that there are ethnic groups which can count above 1,000,000,000,000 and some may not count above 1,000. This is due to variability in number formation.

Number symbolism and mysticism

Zaslavsky (1973) observed that the Pythagorean School of ancient Greece regarded even numbers as feminine and odd numbers as masculine. The author also noted that many people in Sudan have similar beliefs about the associations of numbers with females and males; and among the Kolokuma and Ijaw people of the Niger Delta, odd numbers, especially three, are associated with men and even number four in particular, with women. The author also observed that within the four-day's week, the first and third are the strong days, favorable to men; the second and the fourth are lucky days for women.

There are differences in number symbolism across cultures. For instances, while the Kolokuma and Ijaw people of Niger Delta regarded three as representing men while four represents women; the Kpelle people of Liberia believe that man has one more degree of power than woman and as such the number representing man is four while the number representing woman is three. A boy-child is presented to the world on the fourth day. On this number symbolism, Achebe (1958) had observed that among the Igbos, the medicine man's ceremonial objects were: four small yam, four pieces of white chalk and four palm leaflets.

Among the Igbos, the number 7 has mystical qualities. For example, Achebe (1958) used the number 7 to illustrate the importance of hard work for success in life. The medicine woman admonished Unoka in these very strong words:

...when your neighbours go out with their axe to cut down virgin forests, you sow your yam on exhausted farms that take no labor to clear. They cross seven rivers to make their farms; you stay at home and offer sacrifices to a reluctant soil. Go home and work like a man.

In this case, Unoka can be regarded as a constant figure because when others are working hard to move forward he rather refuses to move. The number 7 is used here to emphasis the importance of hard work and dedication to duty in man's achievement.

It also connotes maleness and perhaps shows that if Unoka was a woman, it would not matter if she did not cross seven rivers to plant her yam.

There are numerous instances in which the number 7 is used to vividly illustrate events and situations. A typical wise-saying by the Igbos which involves the number 7 is “Uwam Uwa asaa, udi ihea agaghi emekwam.” This literally means from now up till my seventh reincarnation, this type of thing will not happen again. The Igbos believe that man reincarnates as many as seven times. The person who used the above expression must have had a gruesome experience. Also, if someone suffered from terrible disease, protracted illness, childlessness, extreme poverty before his death or even sudden death, one elder of the family uses the expression of prayers as the person is buried to appeal to the dead that whenever he/she reincarnates, the calamity that he/she suffered before the death should not revisit him/her. The Igbos call this “ebibi uwa”. Other numbers like 3, 4, 9, 13 etc assume various mystical qualities in different cultures.

The argument of Eukoha against Zaslavsky cannot be ruled out because of the differences in culture and tradition. In Ugep, odd numbers are attributed to women while even numbers are attributed to men. This is because in Ugep, there are certain socio-cultural groups that women are not supposed to belong to. This is because, women are seen as odd figures in such group. While the men are considered even because they are in the rightful social function and they pose no threat to rituals. The women who are seen as odd are believed to pose threat to the social function. This belief system implies that the ritual is neutralized in the presence of a woman. The neutralization can be used to teach the concept of additive inverse or zero concept.

The concept of time and record keeping

In all cultures, time and record keeping are mathematical activities which everybody is very conscious of. This was why Mbiti (1969) argued that the traditional life was reckoned according to its significant events and that among the Ankore of Uganda, cattle was at the heart of the people and as such the day was reckoned in reference to events pertaining to cattle. Eukoha (2010) writing about the African concept of time made the following observations:

When Africans reckon time, it is for a concrete and specific purpose, in connection with events but not just for the sake of mathematics. Since time is a composition of events, people cannot and do not reckon it in vacuum. Numerical calendars, with one or two possible exceptions, do not exist in African traditional societies as far as I know. If such calendars exist, they are likely to be a short duration, stretching back perhaps a few decades, but certainly not into the realm of centuries (Eukoha, 2010).

Obviously, in terms of using numbers for the purpose of time and record keeping, numerical calendars could not have existed in African traditional societies simply because written numbers were not developed. However, there were other very significant methods of keeping record and reckoning time. Achebe (1958) described how Unoka used groups of lines drawn in chalk at the corner of the house to keep record of the number of people and the amount he owed the people. Each group of lines represented a debt owed to someone and each stroke meant one hundred cowries.

There are other interesting incidences of record keeping by using tally marks. Zaslavsky (1973), for example, described how the Chagga wife in South Africa kept records of the number of blows she received from her husband on her wooden cooking spoon. When the spoon handle had no more room, it was time to institute divorce proceedings. There are other ways of keeping records including tying of knots which pervaded almost all cultures. Zaslavsky also observed that the Inca people of Peru developed a complicated form of knot-making which was used to record all their official transactions. The writer further observed that the knots in the various strands, called the quipua represented a place-value notation based on ten and that the quipuas were not only used as book-keeping, they also served as a means of writing history, laws and contracts.

Writing specifically on time keeping, Ojike in Erukoha (2010) maintained that:

Among the Igbos, the sun and the moon are the time keepers, accompanied by the quacking of partridges, the hooting of owls, the song of cuckoos and the second cockcrow awakens the village and the third cockcrow sends workers to the fields. Supper time is announced by birds' songs at dusk.

The Igbos also use the length of the human shadow, the shapes of the moon and the position of the sun to reckon time. Erukoha may be said to be right because in Ugep, the farmers usually use the sun and estimated length of their shadows to tell the time while in farm. Meaning without wrist watch, time can still be told in the African way and records are kept strictly on monthly and yearly bases depending on the period of occurrence or its celebration.

Measurement

Measurement is carried out in many traditional African societies, Zaslavsky (1973) commented generally on the relationship between measurement in Africa and the measures used in Europe in the following words:

The experience of Europe was duplicated in Africa. It is not surprising to find that the measures most commonly found in Africa are very similar to those of the British system – both are based on the human body. The degree of standardization depends on the

requirements of each individual society. The greater the involvement in wide – scale commerce, the greater is the need for standardization. Standardization was responsible for a universal basic of measurement. These standards are important to creative and construction works because curves can be done by increasing the length of measurement. This standardized scale of measurement may not be necessary because the creative African man have special innate skills for measurement, estimation and curves but for taking long distance measurement, standardize scale is very important.

It was stated that, long distance was measured by the African man by throwing stones. Hence, the European and African methods of measurement cannot be ruled out. This is because the European way of measurement complements the African method.

The Bakor experience

Munenge in Ganyi (2014) stated that children were taught the history and ancestral responsibilities of their clans and such knowledge was passed from one generation to another. African children were taught the names of some plants and animals and they were able to memorize those names. They were equally taught the medicinal usages of each of these plants especially in the treatment of ailments. This they do by administering a quantified dosage to the ill person at specific intervals. This accounts for the modern prescription method for curing illness after diagnosis. That is, the number of pills of medication to take and the period to consume is reflected in the traditional way.

Conclusion

Ethnomathematical concepts help to improve the methods of teaching school mathematics. It makes counting, estimation and keeping records very easy. It creates a clear understanding of the subject matter since it is what they have practically experienced within their culture and are used to it. It creates a threat free environment for teaching and learning of school mathematics. In general, having examined all the sub-topics above, it is observed that ethnomathematics is a true reflection of culture as most of the cultural activities introduced in teaching mathematics is the bedrock of school mathematics. Ethnomathematics forms the basis of every concept (topic) treated in school mathematics; however, there are some challenges in applying ethnomathematics holistically in some concepts.

References

- Achebe, C. (1958). *Things fall apart*. United Kingdom: William Heinemann Ltd.
- D'Ambrosio, U. (1997). *Challenging Eurocentrism in mathematics Education*. New York: University of New York press.
- Erukoha, O. I (1995). *The Psycho-Cultural basis for teaching mathematics*. Owerri: Executive publishers.
- Erukoha, O. I. (1979). *The mathematical heritage of Igbos*. M.Ed project, Amadu Bello University, Zaria.
- Erukoha, O. I. (2010). *Ethnomathematics: from home to school*. 48th Inaugural lecture of the University of Calabar. Calabar: University of Calabar press.
- Erukoha, O. I., Meremikwu, A. N. & Ekwueme, C. O. (2007). *Integration of culture in mathematics*. Calabar: University of Calabar Press.
- Ganyi, F. M. (2014). *Orality, Literacy and pedagogical implications in traditional African Society. The Bakor experience in Cross River state, Nigeria*. A paper presented at the 10th Isola conference held at University of Cocody, Abidjan, Ivory Coast.
- Mbiti, J. (1969). *African religions and philosophy*. London: Heinmann
- Ehuche, R. O. (1975). *The use of real numbers in traditional Sierra-Leone*. *The West African Journal of Education XLX2*.
- Ojike, M. (1946). *My Africa*. New York: John Day.
- Zaslavsky, C. (1973). *Africa counts, number and pattern in African culture*. Boston: Webber & Schimmel.