

## **Mathematics in Hausa Culture: Some Examples from Kano State-Nigeria.**

**Dr. Garba Shuaibu**

*Department Of Science and Technology Education Bayero University, Kano-Nigeria*

---

**Abstract:** *This paper is primarily concern with exploring and discussing Mathematics in Hausa culture with particular reference to some examples from kano state, Nigeria. The researcher survey the environment and observed that Hausa culture is rich with many aspects of mathematical study such as bee construction of their cells in regular n-gons design and the two Sallah Festivals. It is recommended that mathematics and Hausa teachers should be prepared to face some very important area of concern such that there is different appropriate mathematics for different societies; hence teachers and students should strive hard to identify them for the sake of promoting what can be called mathematics for survival.*

---

### **I. Introduction**

To be able to integrate Mathematics and its instruction across-school's curriculum and Hausa culture in particular, it may be helpful to teachers and students to gain experience with such integration in their teaching and learning processes. It is worthwhile to say that one of the objectives of education is to teach students how to do Mathematics. As work went on, it became evident that, along with the natural achievement of the aim of cultural studies, other aims were also attained partially or indirectly. It seem to me that the paper may prove to be useful in producing a number of sufficiently necessary common habits of teaching, learning and thinking during mathematics using Hausa cultural phenomena. The use of the Hausa cultural and Mathematical aspects of the phenomena makes it possible by citing relevant and variety of examples at a very early stage of teaching to enable the students to feel relevance, joy and relationship between the mathematical and Hausa cultural views of the context under study. X-ray of literature in the cultural aspects of Hausa environment and its Mathematical relevance shows how satisfactory this paper is, not only from the point of view of Hausa cultural studies but also from the point of view of ethno-Mathematics. For instance Bekken[1990] students projects from the course 'Mathematics and Society' on the life of 'Bees', the construction of their cells and the Geometry of their dance. The writer cited this since it turned out to be a well-known insect and its life cycle in Hausa culture and rich in studying aspects of mathematics such as simplest regular n-gons plane, space filling figures, their geometry and calculus of optimization.

### **II. Mathematics**

Many Mathematical ideas and activities in Hausa cultures in particular are not explicitly mathematical. They are usually intertwined with art, craft, riddles, games, puzzles, jokes, graphic system, shapes, folklores, events and other cultural artefacts. The mathematics is often hidden[Gardes, 1985]. For instance in analysing any traditional work, event or activity such as baskets, chairs, hausa houses and compound, clothes, fish-traps, bees cells, Gidandara, Yardalle hole, Zabiya singer calabash, triumphed and many others, it will easily come to one mind that why do these activities or materials possess the form or shape they have? The form or pattern usually represents many mathematical concepts and offer optimal solution of mathematical problems or tasks. Mathematics as a subject is a science to do with computation, measurement, and problem solving to which everyone require its use in one way or another. People have to count money, measure grains, 'mangala' of sand or 'taki', determine price, time, areas, volume, number of ridges and hectares cultivated, number of 'dami' or sacks of grains made, number of 'Awrad' made and many others. However, the challenge is that mathematics achievement is below expectation relative to other subjects[NECO,2010] reports. This has been influenced by the fact that ordinary and even other elites failed to see the everyday application of school mathematics rather, they perceive it as something abstracts and cold[Bansil, James and Naidoo,2010]. Similarly Eshiwani[1979] observed that the contents, goals, and method of mathematics education are not sufficiently adapted to the cultures and need of African people, Hausa inclusive. To this backdrop there is a need to multi-culturalise the mathematics curriculum in order to improve its quality, to upgrade the cultural confidence of all learners and arrest any racial and cultural bias and stigma.

Therefore, strategies and efforts had to be made to help uplift the standard or image of mathematics through integrating and infusing school mathematics with everyday life. So as to help mathematics concepts formation, develop mathematical thinking and drive away the fear of students on the subjects. Need for the

development of approaches that would improve teaching and learning of mathematics, Hausa culture as well is the necessary and sufficient condition for all stakeholders in Mathematics and Hausa subjects.

### **Hausa culture**

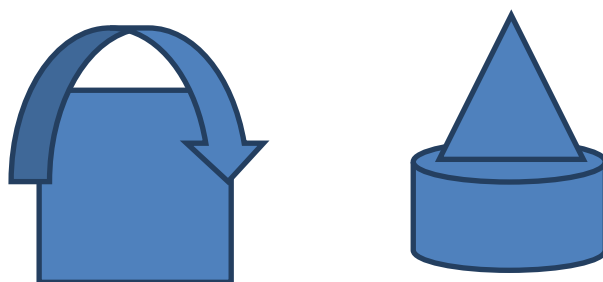
There are more than 250 ethnic groups in the 21<sup>st</sup> century Nigeria. The largest and most politically dominant ones are the Hausa, Igbo and Yoruba. Other minor ethnic groups are the Fulani, Kanuri, Ibibio, Ijaw, Babur, Tiv, Idoma, Karekare and many others. Geographically, the Niger and Benue Rivers come together and form a 'Y' shape that splits Nigeria into three separate entities. Fortunately this 'Y' shape marks the boundaries of the three major ethnic groups with the Hausa in the North, the Yoruba in the south-west and the Igbo in the south-east.

In this paper the Hausa ethnic group's culture is going to be addressed as a way of helping students to understand and like mathematics as well as uplifting the image of Hausa cultural studies. The largest per cent of the Hausa population are found in Northern Nigeria and South-Eastern Niger. A significant number is also found in Sudan, Cameroon, Ghana, Mali, Chad, Central Africa, Co d'voir and Gambia. Hausa people spoke Hausa language and their main occupations are agriculture, trading, blacksmithing, basketry, wood carving, weaving, dyeing, tanning, metal work, Gardawankura, maciji and biri, Islamic teaching and learning. It is really clear from these traits to note that Hausa people must have some aspects of mathematics congruent to pursue of their works effectively.

The Nigeria National curriculum included Hausa among the compulsory subjects in Primary and Secondary school [Waziri, 2010]. This may be connected to the organized nature of the tribe, in terms of traditional administration [Sarki, Dagachi and MaiUngwa], Scholarship and Commercial excellence of the language. In view of this development Hausa culture is rich with mathematical stuffs such as riddles, games, crafts, events, folklores, customs, objects and other traditional festivals. Remarkably Hausa culture aims at developing logical thinking skills, cognitive functioning, verbal fluency, entertainment and recreational activities as well as developing '**mutummailissafi or reasonable person**'.

### **III. Mathematics in Hausa culture**

Milder[1979] in her work 'African counts' which is a stimulating work in the area of the History of mathematics along south of the sahara and contributed to abroad perspective on the area of mathematics called socio-cultural mathematics or ethno-mathematics of Africa. This refers to application of mathematics in lives of African people and the impact that African institutions had on the development of mathematics. Milder[1979] described written, spoken and gesture, counting, number mysticism, concepts of time, number and money, weights and measures, record keeping, mathematical games, riddles, puzzles, magic squares, graphics and geometrics forms, events and festivals as evidences that indicate the mathematical heritage of Africans and Hausa culture in particular. Visual discrimination and visual memory were needed for survival on the wild environment of the Hausa land as represented in Dawakin kudu rocks arts of kano state. Settlement pattern in Hausa culture describe the geometric know-how used in laying out the circular, spiral, conical, rectangular, rhombus and symmetries shapes in Hausa towns, cities and villages. Some figures illustrating Hausa geometric shapes.



Similarly bee hives could bring real life to our mathematics classes when discussion on regular polygons such as: triangle, square, pentagon, hexagon, closed and curved surface polyhedron that are associated with bee well known insect in Hausa land. The idea can be used in Pythagoreans construction of 3-, 4-, 5-, and 6-gons as well as the solution of Isoperimetric problems of enclosing a given area with shortest possible circumference is to use a regular n-gons. The higher the n-gons use the better and the best of them is a circle. Being a BEE hives design pattern common in all Hausa land it touches a mathematics subjects area called TESSLLATIONS. According to Pappos [350 AD] cited by Bekken [1990] stated that economy of wax or honey is the driving force behind the bees' choice of hexagons in its hives construction. Erasmus Bartholin [1660] still in Bekken[1990] expressed that pressure from other cells was the natural reason behind the choice of circle, hexagons or n-gons by the bees. More ever the space fills by the bee cells are more of regular polyhedral consisting of 5 convex as known by the Greeks.

Computationally, when the bee cell is dissected or cut to open the surface will give us some number of rhombi shapes like the figure below the area is found using the Pythagoras formula.

Most of the Hausa and African arts, architecture and design contain strip and plane patterns of bilateral and rotational symmetries. For example Hausa axial and symmetry in basketry, calabash painting, chairs making and curving and the shape of 'RUMBU'. In addition Oloko [1979] identified among the streets traders in Nigeria [Hausa land inclusive] some empirical knowledge of mathematics. For example if the cost of a commodity is N260.00 the cost of 7 or 9 of such items can easily and quickly be mentioned by the trader. Similarly if the trader purchased 20 pairs of earrings at the cost of N4400.00 and other 23 earrings at the cost of N4800.00, he can easily and quickly mentally or with calculating machine determine the cheaper one.

Possible relationship was established between visual memory[Berlin, 1998] and concentration as a sufficient condition for achievement in many games, riddles, transaction and puzzles in many cultures. For instance in Hausa culture there are many games and riddles relevant to the development of mathematical ideas as illustrated in the table below:

S/N	Hausa Riddles and Games	Mathematical concepts
1.	Uku, Uku game gari[Murhu]	Counting, quantity, number bases, etc
2.	Dakin saurayibabukofa[kwai]	Geometry, construction, closure, etc
3.	Hikayarmutum da kare da kaza da dawazasutsallakekogi a kankwale-kwalemai yadaukarabugudadayatakdashimutum. Yayazaitallakedasudayadaya?	Logical thinking, arithmetic operation, problem solving, diagram probability, algebraic equation, etc
4.	Wawanmutummai hudacikinsa[Allura da Zare]	Estimate, logical reasoning, observation, visual memory, geometry, function and limits, etc
5.	Kai yautaine	Resourceful, thoughtful, problem solver, transforming, change and dynamic, addition, abstraction, etc
6.	Shanunadubumadaurinsudaya[Tsintsiya]	Counting, number bases, quantity, diagram, logical thinking, boundary, etc
7.	Aiki da hankaliyafi aiki da agogo	Logical thinking, time conscious, work done, problem solving, strategy, etc
8.	Dara, Carafke, Gala-gala, langa, Macukule, Jataumaimagani, Yarmero, Wayatsallakaka, kullekurchiya, malamnabakinkogi, tankomaikanbashi, etc	Recreation, counting, logical thinking, chance, probability, visual memory, diagram, arithmetic operation, substitution method, time conscious, problem solving, etc
9.	Tantabarusukasauka far akanbishiyar da ake kitsokarkashinta, saima kitsontacesannudari wadda akeyi wakitsontace a asaidai in hadakamarsu da rabinkamarsu. Sabodahakasunawa ne?	Logical thinking, algebraic equation, counting, problem solving, quantity, chance, sharing, etc
10.	Talleyana son yatsunkomangorogudabiyudagacikin lambu. Ammlambun yana da kofagudagomakowacce kofatana da maigadi. Masugadinsukacemasadukmangoron da yadeborasurabadashidaidaiwadaida. Sabodahakamangoronawa Tallezaidebo?	Counting, logical thinking, problem solving, simultaneous equation, quantity, chance, probability, sharing, double, geometric progression, etc

The table above presented some good examples of Hausa riddles and games that are pertinent to both traditional and school mathematics. What is central is for the teachers to increase efforts to sort out more Hausa riddles and games in order to relate outside school mathematics with school mathematics. So that Hausa Mathematical heritage will be promoted and mathematics teachers can explore more ways of solving mathematical problem. For instance, let us try to solve the Tantabaru's problem under example number 9 above where pigeons flew over a tree under which is a hair dressing woman and said thank you 100 the woman whose hair is dressing said they are not 100 unless you add their number and half of them before they become 100. How many are they?

#### IV. Solution:

It can be observed that the number of Tantabaru [pigeons] flew over the tree as assumed by the second woman are their number plus their number again and plus half of their number will then be equal to 100.

Mathematically, let the number of Tantabaru be X plus their number again which is X and plus half of their number is  $\frac{1}{2}X$  will then be equal to 100. Specifically, using algebraic equation this implies:

$X + X + \frac{1}{2}X = 100$ . To find out the number of Tantabaru we need to know what is that X? Multiply both sides of the equation by 2. This become

$$2X + 2X + X = 200$$

$$5X = 200, \text{ divide both sides by 5}$$

$$X = 40.$$

Therefore the number of Tantabaru flew over the tree is forty [40]. Since 40 plus 40 plus 20 is equal to 100.

Another Mathematics component in Hausa culture is in their festivals such as IdlFitr and IdlKabir[Bikinsallakarama da Babbarsalla, Yahaya and Yusufu, 1992] festivals. The mathematics that interwoven in them are among others:

1. The concept of counting 29 or 30 days before citing new month be it in starting the fasting of Ramadan Or celebrating the two salla festivals. First day of the month of Ramadan to start the Ramadan fast, first day of Shawwal to start celebrating the IdlFitr [karamarsalla] and Tenth day of DhulHijja to start celebrating the IdlKabir [Babbarsalla] festival.
2. Time conscious and commitment to know the Lunar Calendar based on months such as Rajab, Shaaban, Ramadan, Shawwal, DhulKhidda, DhulHijja, Muharram, Safar, RabiulAwwal, RabiulThani, Jumada Awwal , and Jumada Akhir.
3. During these festivals there are commitment and sharing of responsibilities between wife and husband, Children and adults, boys and girls.
4. Cultural activities for relaxations likeHawanDaba, Kalankuwa, Dambe, Sharo, Yarmero, Langa, Macukulle, Masuwasa da kura, biri, maciji, and many others.
5. Measurement for and giving out ZakkatulFitr on the first day of Shawwal an obligatory Sunnah on every person in the family, a measure of fourmudNabiyyi. The Zakkah is given to the deserving person[s] not undeserving one. These teach the concepts of limit, observation and identifying the deserving ones, acceptance and appropriateness, spirituality and kindness as well as exactness in measuring and giving out the Zakkah.
6. On sallah day children share food and gifts to relatives, needy ones and friends. People and children wear new or clean clothes. Emir, district head, village head and ward head pay homage to those above them after Imam finished IdlFitr or IdlKabir prayer and Khudubah. From there people start saying 'barka da salla da fatanmuga ta badinbadada' meaning for more or many years to come. This is also indicating the concept of infinity or continuity.
7. When people are living the Idl prayer ground they should follow different road leading to their houses. This teaches adherence to Sunnah, possibility of coming across needy people on that roads, meeting and seeing many different people from those saw in the former roads.
8. During IdlKabir after Chief Imam prayer and Khudubah he will slaughter his Adha preferably ram, then sheep, then he goat, then goat, then ox, then cow, then he camel and finally she camel in that sequence and order. If he do not have the chance of performing the Adha he will asked people when they reach home they should slaughter their own Adha.In the order of animals to slaughter faith preference and consideration is what matter not the size of animal.
9. Hausa culture foster in such communication skills in Hausa language as will enable its members to; take part in classroom activities including mathematics classes, participate in every day transactions and interactions; extract information and derive enjoyment from traditional mass media, consider as a realistic option the possibility of pursuing leisure activities, further study and career opportunities through other languages such as language of mathematics.

## **V. Conclusion**

More importantly teachers and students will develop and acquire mathematical constructs through discovery and exploring wide range aspects of Hausa cultural heritage. This paper tried to use objects, things, events and developments from every- day life of Hausa environment to develop important mathematical skills such as naming, classifying, describing, sorting, recognizing, visual memory and retention memory, comparing, problem solving, computing as pin pointed in the Bee Cells regular n-gons, space filling and optimum computation ability to maximize the economy of surface to cover in hives design. Similarly the number of riddles and games in Hausa cultural environment revealed and provided opportunities of understanding more about mathematics in Hausa society. The wealth of cultural festival s and abundant opportunities in Hausa society and kano in particular motivate people to comment that 'kanotimbingiwa and giwabukardaji'. Signifying many things naturally from the size, shape, 6 months winning period of young elephant baby, elephant habit of not accepting nonsense across her own way and resemblance with the 'hut'[which is circular, conical and triangular]. Also Sallah festivals presented above indicated the richness of Hausa culture in mathematical objects.

## **VI. Recommendations**

Mathematics and Hausa teachers must be prepared to face some very important areas of concern:

- 1 Mathematics for citizenship and the part mathematics have to play in preparing students to take an active part in Hausa culture.
- 2 Mathematics and Hausa how they are related.

- 3 The likely effect of mathematics on Hausa culture in the future and the effect it has had on the society in the past.
- 4 The influence Hausa culture has exacted on mathematical development in the past.
- 5 That there is different appropriate mathematics for different societies, hence teachers and students should strive had to identify them for the sake of promoting what can be called mathematics for survival.

### References

- [1] Bansilal, J. and Naidoo, M. [2010] Whose Voice Matters? Learner: South African Journal of Education. 30[153-165]
- [2] Bekken, Otto B. [1990] Bees and Their Mathematics: A project Integrating Math and Science. Science and Technology Education Document Series No. 38. Paris. UNESCO.
- [3] Berlin, C. P. [1998] When Student Imagines Numbers in Color; Is there a Relationship between Creativity and Mathematics ability? An Independent Studying Education Research. Harvard University, Graduate School of Education.
- [4] Eshiwani [1979] In AMUCHMA-NEWSLETTER-9-August, 1991.
- [5] Gardes, P. [1985] In AMUCHMA-NEWSLETTER-9-August, 1991.
- [6] Miller, K. [1984] Early Counting: Cultural Variation in a Cognitive Skill. A paper delivered at the meeting of the Chinese Psychological Association .Japan. University of Tsakuta. Japan.
- [7] National Examination Council {NECO,2010} Reports. Minna-Nigeria.
- [8] Oloko, B. A. [1979] Children Street Work in Urban Nigeria: Dilemma of Modernizing Tradition. In P. M. Greenfield and R. R. Cocking [eds] Cross-Cultural roots of Minority. Child Development. PP.197-224. Hillsdale. N. J. Erlbaum
- [9] Waziri, M. Y., Saidu, I. and Aisha, H. [2010] Ethno-Mathematics: A Mathematical Game in Hausa Culture. International Journal of Mathematical Science Education. Vol.3 No.1 PP. 36-42.
- [10] Yahaya, I. Y. and YUsufu, Y. [1992] Da Koyo Akan Iya. Littafi Na Biyar. Ibadan. University Press Plc.