

## ***Ethnomathematics: The Crux of Psychology of School Mathematics***

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### **Abstract**

*This paper considers the field of enquiry called ethnomathematics and its psychological roles in the teaching of school mathematics within the school setting. This is because mathematics has become an issue of concern in the educational system today. These roles are considered under the following headings: fraction as life puzzle, Artisans and use of mathematics, Petty trading arithmetic, Effective citizenship and mathematics, Mathematics in the service of science and social science, Teaching of similarity and congruency, Landforms and ethnomathematics and school mathematics. To improve in the teaching and learning of mathematics, teachers and students need to understand the cultural diversity in the classroom setting and be able to apply it to solve mathematical problems in order to curb the Eurocentric problem posed by the western culture. This is very possible because man is a cultural and social being and finds activities involving his or her culture very interesting and less tasking.*

**Keyword:** ethnomathematics, psychology, school, mathematics

### **Introduction**

Mathematics is very important in human and societal development. Therefore, man cannot succeed in life without taking everything he does into account. Erukoha (2010) posited that no matter how sophisticated a society is, it has its own way of counting. In the Nigerian educational setting, there are two compulsory subjects, English Language and Mathematics. But Mathematics has become an issue of concern, due to poor performance of students both in internal and external examinations. The process of trying to curb this problem leads to the emergence of ethnomathematics. According to D'Ambrosio (1997), ethnomathematics is the mathematics practice by an identifiable cultural group. This refers to the various activities in one's culture that are mathematically oriented and which one does

virtually every day of one's life. This paper considered psychological roles of ethnomathematics in classroom setting.

### **Psychological roles of ethnomathematics**

The psychological role played by ethnomathematics in the teaching and learning of school mathematics is quite crucial. This paper discusses the concept under the following headings:

- Fraction as life puzzle
- Artisans and use of mathematics
- Petty trading arithmetic
- Effective citizenship and mathematics
- Mathematics in the service of the science and social sciences
- Teaching of similarity and Congruency
- Land forms
- Ethnomathematics and school mathematics

The subheadings listed above are areas of human life which involve basic calculations which are the foundation of school mathematics. Relying on such foundation psychologically reduces or eliminates the abstract nature of school mathematics as held by learners of mathematics.

### **Fraction as life puzzle**

Ekwueme & Meremikwu (2007), illustrated fraction using life concept as seen below:

An old man had 17 cows. Before he died, he had given  $\frac{1}{2}$  of the cows to the eldest son,  $\frac{1}{3}$  of the cows to the next and  $\frac{1}{9}$  to the last. After the man's death, the children assembled to share the cows. They ran into confusion because of the fraction involved. As they were quarreling, their father's friend came around and asked them what the problem was. They explained. He told them to wait as he went to his house and came back with a cow which he added to their 17 to make it 18 cows. The sharing was now easy as  $\frac{1}{2}$  of 18 is 9,  $\frac{1}{3}$  of 18 is 6, and  $\frac{1}{9}$  of 18 is 2. But, in the process of adding 9, 6 and 2 gives 17 and not 18. This implies that, ethnomathematics is very important in the teaching of school mathematics as the father's friend went back home with his cow and the children rightly shared their fathers cows. Using such example of a real life situation in the classroom makes the learning of mathematics more exciting to the students.

### **Artisans and use of mathematics**

In Enuokoha (2010) the definition of ethnomathematics shows that different professions and artisans use different types of mathematics in their daily jobs. For instance, the motor mechanic who works on the engine of a car follows a particular

sequence in dismantling the parts of the engine. He identifies the bad component and new spare parts are bought. When coupling the engine, the mechanic does this sequentially following a reverse order to the one he/she used in dismantling. One thing is clear, that the mechanic is an illiterate does not really affect his proficiency in the engine work. There are several examples of artisans demonstrating various types of mathematics concepts and processes in the job they do. This can be inferred that the dismantling of the parts is subtraction while the coupling is addition. And so, the fact that the mechanic is an illiterate does not mean he cannot add or subtract. Tailors and carpenters fail to produce better dresses and furniture because they do not know geometrical construction. Over many years of laborious practice, they become used to the measuring tape and perfect in making curves. By this, they produce the works and even vary them as the demand dictates. This practice of ethnomathematics has made life worth living just as the school mathematics tries to accomplish the same objectives of measurement and its application.

### **Petty trading and arithmetic**

Amaefuna (2007) stated that the petty trader does a lot of mathematics in the course of trading. This is because she identifies the different denominations of the currency, give change to her customers and count her money. Even those that dislike mathematics in school, one can be surprised to see how they add, subtract, divide and multiply. This may be because no one wants to incur loss in business. As seen above, it can be deduced that ethnomathematics can disabuse the dreaded nature of mathematics as held by learners and create a threat free environment for teaching and learning of mathematics. Ethnomathematics is therefore the crux of psychology of mathematics.

### **Effective citizenship and mathematics**

School mathematics is largely designed to help one become an effective citizen. For example, one need to pay electricity bill, understand one's gross income as represented on the payslips and pay water bills that reflect what was consumed. In all these cases, simple knowledge of arithmetic procedures are expected but most often, many people do not bother about the accuracy of this bills. Nursing which is traditionally regarded as a female profession has statistics for nurses. Probably, one of the reasons why women flock into the profession is because they want to avoid mathematics. However, nurses need to appreciate mathematics to be effective in their job. For instance, a nurse who is not conscious of the importance of mathematics may not see the need for a careful reading of the thermometer and the sphygmomanometer to record a patient's temperature and blood pressure respectively. If the nurse presents wrong records on the patients chart, the doctor may be misled in taking incorrect decision about the patient and may lead to wrong prescription of medication.

Many motorists, especially commercial drivers do not appreciate the relationship between distance and speed. This reflects in their inability to accurately estimate breaking distances and the possibility of safe overtaking. This situation is worse with commercial motorcyclist popularly called “Okada”. A lot of mathematical reasoning and appreciation is required for safe driving especially in estimating distance and speed. As recorded in Amaefuna (2007), it is obvious that every aspect of human endeavour involves basic mathematics tie to their daily activities (ethnomathematics). Since everything man does at home is ethnomathematically oriented, ethnomathematics is therefore of paramount importance in the teaching and learning of school mathematics. And so, it is the basis for the proper teaching of school mathematics.

### **Mathematics in the service of the sciences and social sciences**

In Zaslarsky(1973), it was also shown how mathematics is used in sciences and social sciences. The author illustrated the science using physics and chemistry and the social sciences using accounting and economics. These he emphasized on the importance of mathematics to these areas of life. The purpose of these fields of study cannot be achieved if the knowledge of mathematics is not incorporated. To teach mathematics very well, the teachers are expected to be well grounded in their cultural activities. Therefore, one can infer that, having good ethnomathematical skills will promote quick understanding of school mathematics. Also, one can see that even the woman in the kitchen does mathematics as she estimates and measure all the required ingredients to cook a particular soup. This means that, ethnomathematics being culturally base is very important in teaching school mathematics. One question to ponder on however is: “what if a learner has no knowledge about his or her culture, how would such a child cope with school mathematics?”

### **The teaching of similarity and congruency**

Billstein, Libeskind and Lott in Erukoha (2010), observed that students confuse similarity with congruency. To properly differentiate between the two Billstein et al (2001) suggested an alternative method for teaching similarity and congruency. This he illustrated using two tilapia fish. A small one and a big one and which creates a clear understanding about the concept of similar shapes. “Similar” is used to describe objects of the same shapes but of different sizes. While congruent is used to describe objects of the same shape and size. It is clear that every aspect of school mathematics is directly or indirectly connected to the activities engaged in by the learners at home or within their environment. It therefore implies that ethnomathematics plays a vital role in the teaching and learning of school mathematics and as such it should be included in the mathematics curriculum at all levels of education.

### **Landforms**

As cited in Erukohu (2002), the problem of land forms posed by erosion can be used to teach mathematical concepts such as areas, volumes, shapes etc. Erosion sites can provide good opportunity for activity-oriented mathematics for children. The mathematics teacher can take the children to an erosion site to collect primary data for mathematics work. This means that, the land forms like knoll, pass, valley, spur etc can be very useful in the teaching of solid mensuration. This will make a clearer understanding of the subject matter because it is something they come in contact with every day of their life within their environment. Being familiar with this in their environment, will ease the burden of perceiving mathematics as a dreaded subject and build self confidence in learning of school mathematics which will in turn boost their self-esteem and result to great achievement in school mathematics. Therefore, ethnomathematics is very important and psychologically influences the students interest towards the learning of school mathematics.

### **Ethnomathematics and school mathematics**

Rowlands and Carsen (2002) identified four different roles that ethnomathematics can play in mathematics curriculum. These include:

- Ethnomathematics should replace academic mathematics
- Ethnomathematics should be a supplement to the mathematics curriculum
- Ethnomathematics should be used as springboard for formal academic mathematics
- Ethnomathematics should be taken into consideration when preparing learning situations.

Examining the four roles above, it is out of point to say that ethnomathematics should replace academic or school mathematics having said that it is the basis of school mathematics and that it should be supplement to school mathematics. This is because the mathematics used in different professions like engineering, architecture, pharmacy, physics etc are referred to as applied mathematics. Applied mathematics include topics like differential equations, vectors, calculus, statistics etc. These are what they classify as academic mathematics but by the broad definition of ethnomathematics, any mathematics employed to solve human problem, no matter the level of civilization, is ethnomathematics. Moreso, ethnomathematics being a spring board for school mathematics is what one should take into account. As cited in Erukohu (2018), all the academic mathematics in the primary school level can be demonstrated using ethnomathematics concepts and processes. He further stated that if primary mathematics is started using the cultural environment of the child, future school mathematics will be better appreciated and understood by students.

Finally, ethnomathematics should be taken into consideration when preparing learning experiences. This is because when mathematics is taught using examples or illustrations from ethnomathematics, then the ethnomathematics will serve as a springboard for academic mathematics. It also helps to validate school mathematics ideas, as examples from the child's culture is used to teach school mathematics. These cultural examples are mostly oral literature since ethnomathematics is literature and culture based.

### **Conclusion**

Man as a social being engages in different types of activities which are directly or indirectly calculated. Most of the cultural activities engage by man have been discovered to be the basis for school mathematics. In the course of this work, the above topics considered show how ethnomathematics psychologically disabuses the negative opinion held by students about mathematics. This is because man develops strong interest for his cultural norms and values as such sees anything that is culturally oriented to be simple. This cultural activities or events when employed in the teaching of school mathematics create a clear picture of the subject matter and promotes understanding. Therefore, ethnomathematics is seen as the springboard for school mathematics and psychologically reduces and eventually eliminates the phobia of students for school mathematics.

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