Ethno-Mathematics of Basotho

Ajayagosh Narayanan
PhD Student, Mathematics Department, Faculty of Education
Rhodes University, Grahamstown, South Africa
and
Deputy Principal, Cenez High School, Maseru, Lesotho
agnarayanan@gmail.com

Abstract

Mathematics as a subject is indispensable in the development of Lesotho with respect to science, technology or any other field of knowledge. It is also a mirror to our past. In this case, Lesotho’s indigenous mathematics is not fully explored and understood by Basotho. This author aims to present ethno mathematics of Basotho as compared to mathematics of other nations and the meaning it carries to the Basotho community. In this article, the author puts an effort to explore an approach that is linked to value-based education through critical thinking and reasoning within the background of ethno mathematics. Through this article, the author takes the reader through the value-based culture of Basotho within the backbones of Ubuntu values using a few metaphors and comparing this culture with Western and Eastern cultures. In short, the African community believes in ‘participation’ that is reflected in all stages of their life. Therefore introducing a participatory approach in a mathematics classroom could definitely benefit the Basotho learners, as this author argues. A meaningful merging of ‘thinking’ approach should also take place to empower these learners, as the author suggests. In this regard, the author brings a metaphor using fractals complementing D’Ambroseean view of individual learning in connection to the community and nature. The values of Lekhotla could also be applied as an approach for learning mathematics in classrooms as this author comments. The author concludes that by incorporating African mathematics into the classrooms, teachers could possibly advocate familiarizing African-ism among learners. It could also re-introduce the social, cultural and political values of Africa by being partners, contributors and participants for developing Lesotho with dignity.

Key words: ethno-mathematics, Indigenous mathematics, mathematics

Introduction

Many teachers believe that mathematics education should have a connection to reality (my experience in observing teachers). Does this ‘reality’ reflect social, cultural, political values or any other value deliberated by teachers or learners in Lesotho? What are the feelings of teachers in this regard? Do they consider learning mathematics is primarily to pass the examination for securing a university admission, decent job with ‘a lot of money’ or to show others ‘how intelligent’ one could be?
The entry of missionaries and Europeans to Lesotho opened door towards formal education that which Basotho recognized as the passage to social and economical security (Ashton, 1995). On the other hand, statistics do not prove that passing mathematics is easy for the learners (Ambrose, 2008), yet a good credit in mathematics is a prime criterion to secure further education in Lesotho for Basotho. Classrooms thus turn into a confused scenario where the learners’ objectives clash with one that of the teachers’. In the end, learning mathematics turns out to be stressful for learners, while teachers lose the track of being the mediators of knowledge, who will be forced to change their approach of teaching mathematics into something that they never dreamt of practicing. As a result, the key purpose of education of linking learning with values is compromised.

In this regard, Basotho have been involved in debates and discussions to redesign the philosophy of mathematics education with the intention of enabling the full development of the human personality and fostering a sense of dignity (Ministry of Education and Training, 2005). Academics from other parts of the world consider mathematics to empower the learners with values (Skovsmose, 2004; Vithal, 2003). This article aims to explore an approach that is linked to value based education through critical thinking and reasoning, within the background of ethno mathematics.

**Culture Based Learning of Mathematics**

D’Ambrosio (2006) considers fitting individuals, society and nature into a triangle where one vertex balances its power and role with the other two vertices to create equilibrium (Figure 1a). Where balance does not occur, tension and conflict produce opportunities until balance is achieved, according to D’Ambrosio’s metaphor. Ethics of diversity according to him comes from deliberate or natural equilibrium and harmonization, whereby the progress of one factor depends on other factors directly, which could be considered artificial, however active such progress could be. Secondly, this perspective does not meet the expectations of the *ubuntu* (African philosophy of sharing and caring) values of Africa, where an individual is a unit and part of the community and nature (Figure 1b). Through this metaphor, I observe the role of nature and community to be shaping the behavior and attitude of individuals. In exchange, individuals also play their role bringing an identity to their community. In this context, one could explore the observations of Ellenberger (1992) and Mbambo (2002) that confirm the role of the Basotho community as shaping young children with social and cultural values. Young ones are taught to honor their parents and are expected to support one another. The most essential part of this teaching includes the lesson that a village is collectively responsible for each one of its inhabitants. This inter-action is not linear (like in Figure 1a). For instance, when conflicts occur, Basotho do not compromise but accommodate the needs of the individuals and the communities with the objective of moving forward for all members involved. According to me, this is the core of *ubuntu* philosophy, and includes contribution and participation.
Shutte (1994) reminds educators that it is their duty to form the child by giving hope, trust and faith, which is literally followed by Basotho community. Shutte further confirms that growth for an African is not only psychological but also ethical and social because African society is famous for its notion of the extended family. A person’s happiness, peace and understanding of justice are dependent on others’. These could be linked to the objectives of education, which are to meet social and cultural values (Vithal, 2003). However, Shutte considers the role of ‘others’ is extended to nature and society, which contradicts the Western philosophy that gives prior importance to the self, who seeks meaning for every action by looking inside. As a result, when a Western man recognizes his existence through his thinking, an African man believes in participation for his own existence. This differentiates the roles played by two continents (Africa and Europe) that made one to dominate (because he thinks) the other (because he participates). The participatory approach of Africa should be fully utilized through education in order to enrich the learning. As the world takes a new turn through a successive and revolutionary transformation, these two thoughts (thinking and participating) must be merged and made into one philosophy. Could this be the millennium goals for Basotho? The moral values of the human being, his inner peace and peace with others, are related to his understanding of justice and ethics, which are evolved through the participatory role he is actively involved in. Education thus should include a philosophy whereby young children learn by participating and exploring new ideas by looking ‘inside’ as well as ‘outside’.

‘Lekhotla’ Style in Classrooms

How do we (teachers) reveal and instill the values (moral, social, cultural and political) to young Basotho? I consider the role of mathematics teachers in Lesotho to be crucial in this context. An exploring mind invents new facts when a mathematics teacher presents a concept to the learners. Real learning comes from finding answers to one’s own questions. Ollerton (2009) suggests that a mathematics teacher should offer a problem (task) to the learners as an introduction that could stimulate enthusiasm among learners. It is the responsibility of the teacher to facilitate learners to find their own mathematical solutions. One could achieve this through the deliberate introduction to the culture of mathematics learning program within the classrooms, where by learners’ positive attitude towards mathematics is greater than their desire to submit the correct answer to the teacher. Instead of rushing over the topics, is it possible for teachers to manipulate a task that involves few mathematical concepts and then engaging the learners to explore this? Peers could involve in discussions to find solutions. This approach of exploring is similar to the lekhotla (Basotho public court) tradition of the Basotho community, where they gather and discuss various aspects of a challenge they are facing. This also brings democracy (and instills political values) to the learning by providing equal opportunities for all learners. At this point, it is relevant to look at the two figures shown below.
Considering the D’Ambrosian metaphor on individual, society and nature, I find this view closely affiliated to Maslow’s hierarchy of needs (Simons, Irwin and Drinnien, 1987). Maslow’s hierarchy theory progresses from physiological needs, safety needs, needs of love, affection and belongingness and needs for esteem to needs for self-actualization. This theory is illustrated through a pyramid with different levels representing physiological needs such as food, oxygen, water etc as the lowest level. Once the need of one level is satisfied and fulfilled, the individual enters the next level of needs. Maslow also thinks that an individual cannot enter the next level before successfully satisfying the previous level. Even though ultimate destiny of an individual and his need to reach the final level of self-actualization is not deliberate, he could reach there only if he crossed other levels of needs successfully. Many hindrances make this move slower. Maslow recommends a person-growing approach in education to reach the final goal of human needs. Bringing Maslow’s theory into the D’Ambrosian theory, the role of society and nature to attain the self-actualization is emphasizing the interaction (through conflicts or participation) between these factors to fulfill each level of their needs.
The interaction is linear (within the vertices of triangle) in the D’Ambrosian theory. This linear interaction is not common among other cultures. For instance, Indian philosophy considers the physical and physiological needs (lower level) are the means to reach the final level (Nirvana, free from all desires). In essence, an individual could attain the final level of self-actualization through other levels. These levels are thus empowering an individual to reach the final level (which is the ultimate destiny according to Maslow). For other organisms, these levels possibly end by reaching the second or third level namely security and reproduction. The evolution did not end there. The evolution of Homo-sapiens (scientific name for human being) from primitive primates definitely reached a third level of love, affection and belonging that was refined through critical thinking and reasoning. Human beings thus evolved into social animals through developing the mind towards the final stage of self-actualization (nirvana). Sharing their experience with others would create a meaningful and valuable future generation.

A similar goal could be achieved through mathematics classrooms and create a community with dignity for Basotho. Vithal (2003) argues “The task for mathematics education is in offering experiences of how to apply the thinking tools of the curriculum in such a way that they are recognized as functional knowledge by pupils not only to become critically aware but to transform that awareness into social or political action.”

**A Complementary View**

The D’Ambrosian theory could be complemented with another view that fits Africa (Figure 1b). The circles within larger circles show the dependence of the inner units that shape the culture within the harmony of other factors, where nature is the universal set whereby all other factors are subsets to this universal set. The security offered by the community and nature explains a ‘to and fro’ interaction as well as intimidation of members of the community he lives in and with the nature, which provides full security to his needs. The final destiny for an African is not to be a poet, storyteller or anything else, but to carry on with life to secure a morally valid future for his off-springs in a broader sense. All generations were aware of their ancestors who protect them. The rituals and ceremonies are thus enriched by praising the ancestors for protecting them regardless of their sins and ignorance. Their self-actualization is thus not to attain the destiny they are born to, but to play their humble role as mediator for the next generation. Such messages are wisely delivered by all elders of the community to their younger ones. Interacting and engaging with the young ones in various life-oriented activities are part of their culture (Ellenberger, 1992; Ashton, 1995; and Mbambo, 2002). This includes cattle rearing (for boys), house-keeping (for girls) and many other daily routines of Basotho.

The circular metaphor brings a dynamic to the triangular metaphor. The inner circle that represents the individual gradually enlarges (transformation) to society and then
to nature. In my view, this is actually a ‘reaching out’ and attaining nirvana. In other words, whatever comes from nature to individual could go back to nature. Such ‘swinging’ movements include intimacy (of D’Ambrosio) and conflicts that strengthen the society. Nature plays a crucial role in this inevitable process by fitting the individuals within this society (Darwin’s theory of evolution). The conflicts and collaborations are part of the fitness, which makes the individuals share what they achieve with others as well as gathering from them. Through a set of circles like this, it could be viewed that an individual becomes subset and primary set that successfully survives (fits into), according to the guidance and rules set by the community as well as the limitations existing within nature. In such a community, the past and the ancestors play key roles where experience and their foresights shape the future of the individuals as well as shaping the society they live in. The best example comes from the life of King Moshoeshoe I (1786-1870) who founded Basotho nation (Casalis, 1991; Ashton, 1955). In this context, it is necessary to reflect on the era of colonization where-by literacy and numeracy were taught by missionaries and their agencies with an intention to de-culture Basotho and to en-culture European values without preparing Basotho community to go through a transition period. This created a power imbalance and distrust among Basotho, which made learning European mathematics difficult for them. Basotho learners were the receiving members at their own expense that suited their counter-parts globally. In this context, Basotho are still paying for the damage produced by Euro-centered education in generating a fear of learning mathematics. Ironically, I have noticed from my various classroom observations that the Lesotho mathematics teachers have not yet come out of the content based authoritarian style (Western and pre-modern) of teaching in the classrooms.

How do we find a resolution to this negative vibration sent by the past? My experience in the classrooms suggests a full involvement of educators with a focus on the participatory roles of learners could bring an evolutionary change. Teachers should divert their ‘chalk and talk’ (authoritative) style and bring an enthusiastic participatory role in the learning of mathematics. Presenting a task, engaging the learners to explore it, analyzing and finally solving could link ‘lekhota’ culture of Basotho community into the classroom. Teachers could then deliberately monitor the involvements of the learners towards an expected goal. One limitation I found in the lekhota is that no women were allowed except as witness or parties in a case (Ellenberger, 1992:266), which could be the influencing factor due to a male dominating community structure Basotho have. On the other hand, one should not undermine the role played by Basotho women on building the community by remaining at home, to take care of her children and to become the custodian of her husband’s possessions in the house. In this case, she was the ‘silent and salient partner’ in the building of the community.

In this context, reasoning and critical thinking of Africans (including women) are shaped by the community they live in, where justice, fairness and peace ripen
organically with share and care (*ubuntu* values). The African philosophy thus could possibly outgrow the capitalism of the Western world in the long-run, if given the right kind of orientation and participation through dialogue. In such communities, an individual has a responsibility to take care of his/her own community where he/she is a part, through an extended family. The wealth is evenly distributed in such communities with care and love. I consider such culture and its ethics, which has developed through careful planning and reasoning (by *lekhotla*) as well-established mathematics of this community. Understanding of their mathematics (critical thinking according to D’Ambrosio) is essential to bring back these values into the Basotho community and is essential for a successful African-ism among Africans! I am afraid that the inclusion of modern-ity and Western-ity through their mathematical concepts is likely to bring difficulties that make learning mathematics as a Herculean task to Basotho learners. A typical example follows, as measuring the land was not common among Basotho community (Wallman, 1965). They used to develop land as the need arose. Once the land was exhausted, it was left for some years before using it again. This tradition indicates the rich culture of showing respect to the mother earth, which is the only home for her inhabitants. The Africans thus brought a pattern in their life that is not abusive of the earth’s resources. The similar culture is seen in the arts and artifacts of their daily lives, which could be excellent demonstrations of fractals, transformations, sequences, similarities and other more concepts in mathematics.

Using these familiar observations as classroom resources could make learning mathematics easier for Basotho. Basotho learners could thus prepare their long journey through a path known to them towards modernity and universality without any conflicts. I emphasize conflicts because, in 19th century evangelization, enculturation and many other missionary activities deliberately demonstrated that Basotho were wrong in their culture and traditions. In a culturally oriented system, where nature is highly respected and closely related to their life (an individual and his community), the individual is completely subject to nature. Does it mean that we consider learners to be the subjects of African mathematics (Schafer: 2006)?

An African does not fight with nature but abides by its law, which I see as eco-friendly and very natural. In such conditions, an individual comes to terms (participatory role) without confronting nature. Thus, humanity is not compromised but progresses and develops with dignity. Here D’Ambrosian peace and justice is maintained without any conflicts and tension. This is the true picture of *ubuntu* values that we need to foster in each and every one of the learners by engaging ethno-mathematics in the classrooms. D’Ambrosio acknowledges the role of mathematics as a form of knowledge that has everything to do with ethics, justice and peace that makes the learning of mathematics as ‘ours’ (ethnic) as much as ‘theirs’ (Western) so that ‘knowledge’ is universal as much as personal. That is why I consider mathematics to be learned by all students with reflection on history, philosophy and education as D’Ambrosio (2006) argues. One should remember that today’s
mathematics (modern) originally started as somebody’s (ethno) mathematics in Europe with various contributions from Indians, Arabs and other parts of the world without considering any contributions from Africans. (We should leave Egypt out of this argument due to her close relationship with Europe and Asia). As a result, universality of mathematics was challenged and compromised and thus became partial and incomplete. To make learning of mathematics complete and perfect, it is essential to include African mathematics (ethno-mathematics and indigenous mathematics) in the curriculum for Basotho learners so that ‘our’ voice is equally presented with ‘others’ in this millennium era to progress in today’s world. Narayanan (2011:52) in his study concludes that incorporating indigenous (and ethno) mathematics in classrooms creates a background for learners to be actively involved in the learning. In addition, such traditional knowledge instills self-respect and respect for their community as this author argues. Furthermore, as Vithal and Skovsmose (1997:20) observe, a traditional influence and its familiarity create a background for learning mathematics in classrooms for Basotho youth.

**Brainstorming the D’Ambrosian Metaphor Further**

“The adventure of the human species is identified with the acquisition of styles of behaviors and knowledge to survive and transcend in the distinct environments, it occupies, that is, in the acquisition of ethno-mathema-tics” (D’Ambrose, 2006). He defines ‘ethno’ as the natural, social, cultural and imaginary environment; ‘mathema’ as explaining, learning, knowing and coping with and ‘tics’ as modes, styles, arts and techniques. We could use the story of the Bakoena clan of Lesotho (described by Eugene Casalis who met King Moshoeshoe in 1833) as an example.

The Bakoena clan, like all other Sotho speaking people, considered Molimo (the Basotho god), as the source of knowledge (mathema) and therefore as the supreme power. This could be interpreted as their understanding of nature and the universe that had an impact on everyday life, days and nights, rain, seasons etc. They respected their ancestors (ethno) who blessed them with rain, children, victory in wars, and prosperity. The role of the ancestors in African culture represents the past and the future. Past is connected to present through legendary ancestors who shaped the present (tics). Ancestors also play the role of mediators between human and nature, an agent of Molimo who brought wealth and prosperity to their families (mathema-tics). This also means that the future is shaped by the guidance of their ancestors through gifted members of the clans. For this reason, the Basotho community prays and shows respect to the ancestors during ceremonies as well as during hard times. Violating the laws and customs were considered a crime that deserved punishments. Gifted members of the community interpreted visions and dreams and predicted (ethno-mathema-tics) the future accordingly. The laws drafted by the elders and chiefs show an organized community. Rituals and ceremonies were celebrated with respect, enthusiasm and with the intention to teach the younger generation values and respect. The ubuntu values and other philosophies of the
community are evident in many rituals and ceremonies of African life. These are highly respected and strictly followed. This is the self-actualization of a civilized community according to the African standard.

I consider all these as evidence to a high-class society with their understanding, reasoning and critical thinking, where 'their' mathematics might have developed with an understanding of the need for education to make their members involved in effective farming, trading, protecting the community and progressing. The consequences of these developments are dynamic and non-linear. Peace and justice is maintained. The circumcision and initiation schools were important for these communities to educate the young men/women long before the formal schools were established. Arts (weaving, beading, paintings, etc.) and other entertaining activities were evidently developed. A clear demonstration of knowledge of numbers, patterns, shapes, interpreting (critical thinking and reasoning) and predicting were evident in this wealthy and peaceful community.

All these arguments lead towards my observation that the triangular metaphor (D'Ambrosio, 2006) of individuals, society and nature cannot fit into the ubuntu philosophy of Africa for the following reasons. African philosophy and culture acknowledges the concepts of circles and straight lines, which play many roles in their rituals and ceremonies. Polygonal shapes (such as triangle, quadrilaterals etc.) were not familiar to these communities before the arrival of Westerners. Three fact(or)s mentioned by D’Ambrosio fit into circles within other circles (Figure 1b), fitting well with the philosophy of sharing and caring values of ubuntu. In this perspective, humanity, dignity, justice, peace and other values are not compromised; instead, they are transformed through contributions from society and vice-versa without any imbalance, confrontation or conflicts (D'Ambrosio, 2006). I find this view complementing the idea demonstrated in Figure 1b. We could locate further evidence in lekhotla, rituals and ceremonies with D’Ambrosio’s triangular interaction within such fractals.

**Basotho-mathem-a-tics: A Critical View**

This demands further exploration on the idea because circles within circles could easily fit into various aspects and relationships of individuals to others as well as to the nature in which force (external and internal) plays a central role in the African philosophy that shaped their culture and tradition. A typical example is the African concept of time (Ochieng'-Odhiambo, 2002) with an emphasis on the past. I interpret this as their close connection to their ancestors (not Molimo-the god). An African is shaped by such forces (ancestors and their experiences, fore-fathers and their tales) that made them live the present fully and whole-heartedly. As a result, the future is already shaped accordingly. This is different from the western concept of time. His (western man’s) time is like stretched arms, with time moving from left (past) to right (future) where the body (life) represents the present. The ‘present’ is worthless and
non-existent within the context of past and present. That is why many religions considered living for today is worthless unless it is lived fully and sensibly. The past-present-future (to me) also represents a cross. Ochieng'-Odhiambo (2002) claims that African culture does not accommodate the future but realizes the past. This view contradicts western or eastern concepts on time and philosophy as well as their attitudes towards African cultures. The sin committed by the early missionaries and colonizers should not therefore be repeated by the present leaders of this nation. Missionaries rejected Basotho customs under the pretext of being un-Christian. The colonizers forced their own laws and policies on this community. Such sins in this modern era might damage the African values further. African 'pitsos and lekhotlas' are the core of African politics of the past that shaped the future, which are ignored by today’s leaders. As a result, democracy of Lesotho is compromised and limited for Basotho. The sense of being a Mosotho is the central force (within) as well as the driving motif (progress) for all Basotho, which should be the identity for this community. All of us need to acknowledge and value this identity in order to attain freedom from many limitations through a new learning culture instilled by ‘lekhotla’. This author recommends that such tradition could be incorporated in the mathematics classrooms to build a new learning culture for Basotho children.

Conclusion

As I observe individuals form the units and become part of a wider spectrum of society and nature, and this communal structure builds ‘the true African’, as demonstrated by the Bakoenia clan and their culture. When teachers ignore this fact, it devalues justice, morality and reasoning of the Africans, which could lead to another ‘apartheid era’ for Africa because they become participants without being partners (discrimination). Critical thinking could be damaged or manipulated by other cultures under the pretext of globalism and millennium goals. By accommodating ethno-mathematics (African mathematics) into the classroom, teachers could possibly advocate familiarizing African-ism among learners. In the long run, teachers play a role towards a better Africa and help Africans to re-establish peace and justice (D’Ambrosio, 2006) because it represents what Africans lived for in the past. It could also re-introduce the social, cultural and political values of Africa by being partners, contributors and participants in developing the community.

References


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Notes:

*Lekhotla:* Chief’s public court where arguments and counter arguments are presented (Ellenberger, 1992).

*Molimo:* Invisible being, a god (Ellenberger, 1992).

*Nirvana:* A high spiritual state of freedom from all suffering which is achieved by removing all personal desires, or a state of perfection (Cambridge International Dictionary of English, 1996).


*Ubuntu:* African values of share and care that is expressed in Xhosa proverb as *umuntu ngumuntu ngabantu* means a person is a person through persons (Shutte, 1994).