Devkota, S. P. (2013). Ethnomathematics and Multiculturalism. Open Science Repository Mathematics, Online(open-access), e70081969. doi:10.7392/openaccess.70081969

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ETHNOMATHEMATICS AND MULTICULTURALISM

As a mathematics student, I have attained many training and professional development sessions to develop my teaching skills conducted by different publications, organizations as well as curriculum development center. In every training and workshop, we have discussed about the problems of students to acquire mathematical knowledge. We never talked about curriculum and pedagogy which have been affecting students to perform better.

After attending many classes in 'Diversity Education', in my Mphil degree, now, I start to think that the subject that I have been learning for many years should be looked from alternative perspectives. "Can I think mathematics as a bi–product of many cultural practices? Are there any contributions of my culture in main stream mathematics?" These questions guided me to rethink about the *common sense* about the Mathematics that, it is a rigid, core subject and far from daily life practice.

Powell (1997) states that the inclusion of mathematical ideas from diverse cultures can make the mathematical understanding and recognizes different practices of a mathematical nature in varied cultural procedural contexts. If students' experience from their cultures can be linked to academic mathematics, it will construct a students' lives related curriculum of mathematics. According to Banks, Banks, and McGee (1989), culture is to apply to all aspects of life, the totality of meanings, ideas, and beliefs shared by individuals within a group of people. Thus, in my research, culture includes language, values, norms and customs, where art has played a central, integral role. Many cultures do not have a separate name for art, although they produce a vast collection of objects, which transcend useful functions and address aesthetic needs. Each culture and subculture has provided its own standard of excellence in this regard. It is important for art educators to view and assess art

objects based on their own cultural terms from within their original cultural contexts. According to Hofstede (1997), as we begin to see from others' intercultural vantage points, appreciation moves beyond observing from the outside, where we only see in terms of our own cultural experiences, and move toward more authentic cross-cultural understanding.

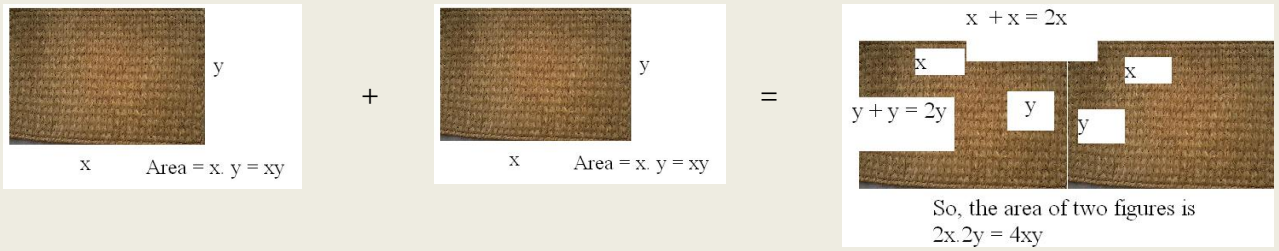
Changing demographics and global communications are increasing in the pluralistic nature of our world. The ongoing search to fill the need for human understanding and for multicultural education has found rich resources in art. Therefore, it is widely held that art education has the ability to assist students in developing the valuable skills of learning to appreciate diversity of art forms, artistic viewpoints, and problem solving strategies. This suggests to me that the relation between mathematics and culture can be defined as "the study of the culturally-related aspects of mathematics; it deals with the comparative study of mathematics of different human cultures, especially in regard to how mathematics has shaped, and in turn been shaped by, the values and beliefs of groups of people" (Hammond, 2000, p. 11).

I argue that we need to care about our past because studies in this area attempt to identify the historical mathematical contributions of different cultures across the world. Early examples include D'Ambrosio's (1980) review of the evolution of mathematics and his call for incorporating ethno mathematics into the history of mathematics (D'Ambrosio, 1985). Dossey (1992) asserts that mathematicians do not agree on the nature of mathematics, debating whether or not it is bound by culture ("interna-lists") or culture-free ("externalists"). Internalists such as Bishop (1976, 1983, 1986, & 1988) believe, in Bishop's words, that mathematics is "a cultural product which has developed as a result of various activities" and that counting, locating, measuring, designing, playing, and explaining are all parts of that cultural product. Others, including critics of ethno mathematics are externalists who believe that mathematical thought is virtually culture free. Similarly, anthropological research

focuses largely on intuitive mathematics thinking developed in largely undereducated cultures, and these studies examined populations varying from native peoples of Australia, Africa, the Pacific Islands, and North America, to construction workers in Brazil.

But I had been learning mathematics by parrot learning method like, circle chapter by using formula. There was never used any kinds of goods that have cultural connection. Now, I come to know a *Naglo* (Tras. a circular disc made by using bamboo and widely used in sheaving purpose) is an example of circle. If I say *Naglo* is a circle, In my teachers thought, students (we) should not make imaginary shape in our mind; we have a real object from our daily life practice to connect book stuff with our real practice. I think if teacher used they way, this makes our classroom more effective.

Yes, I believe mathematics can be looked from my cultural perspective. To teach xy + xy = 2xy, it has been very hard job for me. Nevertheless, I have never think about the material in our daily life which I could use as a xy (product of x and y). Now, I start to think that a *Chakati* (Tras. small mat made by hey) can be used as xy and it would be easier for me if I use two *Chakati* to visualize my students that xy + xy= 2xy.



For the *Chakati*, that my grandmother has been using for 90 years can be used as a very good resource for me to teach algebra and geometry as well. For the *Chakati*, if length is x and breadth is y then I can say its area is xy (in term of variable I can use it in Algebra and in term of area I can use it in geometry).

As I am from the rural background where I got enough opportunity to observe how culture facilitates the students to learn their mathematics lessons more effectively, the

following example concerns with teaching mathematics and compassionates the conformity for contextualization of mathematics education in Nepal while teacher goes to teach geometry. The materials as shown in the picture below are also easily available in our local level.

(UNESCO, 2008)

While looking at the above doko, we can see mathematical symbolic representation, different geometrical shapes and lines with their character. Unquestionably, there can be different geometric interpretations. Some lines are straight and some are curved. Some of the pairs look parallel and some others look intersecting. Among them some lines are horizontal, some are vertical and some are at a slope with horizontal. There are geometrical shapes of triangles, quadrilaterals, pentagons, hexagons, etc. There are some squares and some figures are rectangles and parallelograms. The doko itself as a whole forms a pyramid. What a surprise? Every part of the doko is concerned with geometry and it represents a unique geometrical shape in our culture. Subsequently, why we don't use such materials which are easily accessible to us for teaching mathematics in our classroom?

(UNESCO, 2008)

I am presenting here another example. Can we see different geometrical entities in this house? Surely, the geometry of wall, the geometry of roof and the geometry of doors and windows are mathematically significant. Moreover, the wall is made up of clay bricks and it is rectangular in shape. The roof has a slope at an angle with the horizontal line or surface. The students can explore angles, patterns and shapes at the different parts of the house together with their measurements. This way we can engage students in the discovery of geometrical application in our classroom teaching. Like that, here are so many things in our culture which can mathematically be represented. Such things could be quite meaningful in learning mathematics if the teachers demonstrate them mathematically in the classroom.

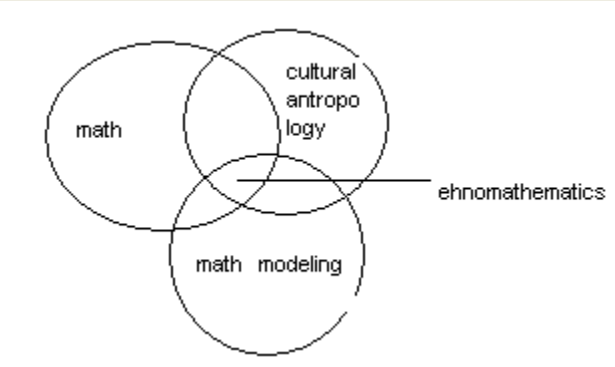
I think Mathematics was developed and in the phase developing having high influence of different cultures. It is not a subject mater which should follow an absolute grammar. Thus, I support mathematical ideas that not only non- literate people have Ethnomathematics but a reflection pf each categories of people from different culture is Ethnomathematics.

The statement of D'Ambrosio (1990), which is slightly broader than Aschar and Aschar (1994), even it is also ethnocentric as Aschar' definition, which says that the mathematics is termed as Ethnomathematics which is practiced among indefinable cultural

group such as national tribal societies, labor group, children of certain age bracket, professional class like doctors, engineers, carpenters, plumbers etc.

Even the term is not defined by standard dictionary this implies that dictionary is euro– centric so it merely supports culture and practices of west by not east. However, for me Ethnomathematics is the mathematics which takes into consideration the culture in which mathematics arises.

A multicultural class is fertile platform for the growth and extension of mathematics. So, different Ethnomathematics are arisen from practice of multicultural on a mathematics class. Ethnomathematics relates cultural anthropology, institutional mathematics and utilizes mathematics model to solve real-world problem (Orey & Rosa, 2004) . In Venn diagram it can be represented as:



(Orey & Rosa, 2004)

Thus, I got that main purpose of Ethnomathematics program is to relate between pure mathematics, cultural anthropology and mathematics modeling.

Accepting and rejecting Ethnomathematics as constructive factor of future mathematics, I have many agreement and disagreement about it. I agree that multicultural class which is main key agent to develop Ethnomathematics promotes the right of diverse people according to various aspects. I agree that these multicultural practices allow learners to enable to understand issues and problem of our diverse society (D' Ambroio, 1990). I prefer to say Ethnomathematics deals with both content and the processes of curriculum, classroom management, teachers' expectations, administration, students and the community.

My experience as a student , I support that students and teacher both get the chance to develop their skills and knowledge if we are able to connect mathematics in our culture. I think this practice bring multiple ways of thinking in teachers and students. This practice increases ability and creativity. Such practices make students a researcher and experts itself and teacher as a facilitator and adviser only.

I know there are many challenging parts to promote Ethnomathematical culture. Due to fixed traditional school curriculum and limited time no such education has been practiced. Lack of sufficient knowledge of teacher, a teacher may be biased to one culture generally that s/he is practicing. I like to consider Ethnomathematics as a key agent of constructivism. Due to political influence in policy level, only socio-economically sound people are benefited and mathematics is molded towards their own wish. Similarly, I got danger which may arise about Ethnomathematics which being diverted towards folkloristic introduction to real mathematics (Orey & Rosa, 2004). Thus, I got that Ethnomathematics is very useful to understand mathematics. Indeed it is bi–product of our cultural practices but its meaning and use are distorted in the favor of elite.

I suppose Nepal as a culturally diverse country according to ethnicity, lingual identity, geographical identity, religion, race, belief and politics too. In Nepal, it is supposed that caste system was introduced to benefit different professions. Each professional people have been following their own culture and Ethnomathematics too. E.g. carpenters are using one type of to measure wood, goldsmith are following own way to measure amount and size of gold and silver, leather worker, Brahmins etc all ethnical and racial group have their own mathematics which is socially transferred from one generation to another. Similarly, every religion, geographical people and different modern professional people have their own language and mathematics. In my opinion if we respect multiculturalism and if teachers and educators are trained to respect cultural diversity then we need not follow only western pattern of

mathematics, but following own mathematics we can achieve greater than west in mathematics as Nepal is a beautiful garden of multicultural people.

Hence, I can conclude that the mathematics that has arisen from cultural practices is Ethnomathematics and there are various benefits of such Ethnomathematics which increases creativity, ability and way of thinking of learners, teachers as well as in the context of education. But time factor, fixed curriculum and narrow knowledge of teacher and students as well as policy maker are some constricting factors. In my opinion, Nepal is a country having different aspects of multi-diverse and multi-culture and great math can be constructed by such multicultural and Ethnomathematics concept, which will make us independent in creation of mathematics by taking less support of west. By which, in my view a really beautiful garden and social-constructivism of different culture will be created and a great tolerance of cultural diversity will be created with respecting others ethics, values and norms.

REFERENCES

Ascher, M. & Ascher, M. (1994). Ethnomathematics: A multicultural view of mathematical ideas. Atalanta: Chapman & Hall.

Belbase, S. (Ed.). (2007). Ethnomathematics *and teaching and learning mathematics from a multicultural perspective*. Kathmandu: Kathmandu University.

D' Ambrosio, U. (1990). The Program Ethnomathematics: A Theoretical Basis of the Dynamics of Intra – Cultural Encounters. *The Journal of Mathematics and Culture, V1*(1) .

Hammond, T. (2000), *Ethnomathematics- concept and definition and research perspective*. [doctorial dissertation]. Columbia University, New York.

Hornby, A. S. (2005), *Advanced learners' dictionary of current English (7th ed.)* London: Oxford University Press.

Orey, D. C. & Rosa, M. (2004). Ethnomathematics and teaching and learning mathematics from a multicultural perspective. *Journal of mathematics and culture, VI*(1).