

Anthropological Agenda in Mathematics Education

Lila Bahadur K C

Associate Professor, Department of Math Education, Butwal Campus, Tribhuvan University, Kirtipur, Nepal

ABSTRACT

The context of this qualitative research paper was the reflection of anxiety of the author still not practicing ethno-mathematical ideas and not humanizing mathematics by mathematics teachers in the classroom especially in boarding schools of Butwal. This research paper was based on reviewing three literatures: Vygotskian socio-culturalism, Freire's educational theories and Devkota's article on "Ethno-mathematics and Multiculturalism". The reflection of boarding school's Principal, a neighboring child of boarding school, perception of a migrated student, a mathematics teacher of boarding school, a guardian of boarding school and mine experience in an interview with mathematics teacher were the subjects of expressions in this article. On the basis of three literature review and the reflections of the participants, this research revealed that the mathematics teachers of boarding schools, view mathematics through positivistic paradigm and uni-dimensional lens, follow Euro-centric pedagogy, use various hegemonic practices of de-contextualized mathematics in class which cause the students' emancipation voice from respective sides.

KEYWORDS: *Anthropology, Ethno-mathematics, Multiculturalism, Multi-mathemacy, Situated Learning*

INTRODUCTION

The discourse of appropriate pedagogy in the education sector has been running since the period of Plato, Aristotle and continue up to now. Since one-half century, socio-cultural theory is in the center of pedagogical discourse. Socio-cultural theories depend on the social constructivist worldview which thinks about information is developed socially through cooperation and shared by people (Bryman, 2001). Socio-cultural theories posses learning and improvement go together at a time (Vygotsky, 1978). This theory portrays human cognitive development evolves through commitment in social exercises, as an individual collaborates with others, articles, and occasions. Human intellectual improvement can't be isolated from the social, cultural, and recorded settings from which such advancement develops (Johnson, 2009). This social and social commitment is intervened by socially developed devices, for example, language, materials, signs, and images that make particularly human types of more elevated level reasoning. In his notable hereditary law of improvement, Vygotsky stressed the power of social communication in human intellectual advancement where human mental capacities rise twice: "first, on the social level, and later, on the individual level; first, between individuals (between mental) and afterward inside the student (intra-mental)" (Vygotsky, 1978: p. 57). For equity, equality, and inclusion to learners; the need of collaborative, co-operative approach which is the basic part of socio-cultural theory, is realized. It helps learners to socialize and to form positive psychological attitude.

From this perspective, learning and development occur on two planes: first on the social plane (interactions with others) and then on the psychological plane (within the

How to cite this paper: Lila Bahadur K C "Anthropological Agenda in Mathematics Education" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-6, October 2020, pp.1206-1212, URL: www.ijtsrd.com/papers/ijtsrd33598.pdf



IJTSRD33598

Copyright © 2020 by author(s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0>)



(learner). This describes a process of human cognitive development which is situated in, but not limited to, social interaction through mediation (John Steiner & Mahn, 1996). Vygotsky proposes three forms of mediation: tools, signs and symbols, and social interaction. The social interactions rely on social relations. These depend upon the dynamic power, position and social location of learning. The perspective of socio-cultural theory is able to integrate culture, social interaction and individual thinking and speech. Human beings are created by the society in which they live and it represents the determining factors in the formation of their personalities. Vygotsky (1996) writes that social environment is class based. So, new social relations are imprinted by the class basis of the environment according to him as being Marxist follower. Marxist view claims that the workplace is the key site in the production of the social being of adults. So, schools may be considered a key site in the production of the social being of the youth and students' social being has significant implications for life as a learner.

Paulo Freire is also follower of Marxist philosophy. He describes many dimensions of educating marginalized pupils in his book; 'Pedagogy of the Oppressed'. Paulo Freire also states that knowing is a social process, whose individual dimension, however, cannot be forgotten or devaluated. Knowledge should not be limited to logic and content (text book), or emotions and superstitions, but should seek the connections between understandings and feelings. Freire talks about the fallacy of looking at the education system like a bank, a large repository where students come to withdraw the knowledge they need for life. Knowledge is not the set commodity that is passed from the teachers to students. He also adds that teaching is a political process. It must be a

democratic process to avoid teaching authority dependence. Freire challenges the conventional assumption that there is an equal opportunity in democratic society. He also asserts that education is a political process. Schools become tools that are used by parents, business and the community to impose their values and beliefs. While no intentional harm is intended, this process often results in the operation of less privileged persons. Freire's entire education career is based on his desire to provide greater opportunity for poor, marginalized people and oppressed people of the world. The main aspect of Freire's education theory is that all pupils must have the opportunity of learning in the social and cultural circumstances. This type of education must have value for their life. These two above theories of education are both in Marxist philosophy. Marxist philosophy always stands on the side of labor, farmers or the people of rural society.

Background

The discourse of the importance of subjective knowledge has been ongoing for about six decades. The pedagogy of social constructivism also has been on the discourse after 1970. Preparing constructivist teaching learning activities is also the source of Vygotsky's social constructivism. Similarly, D' Ambrosio had brought mathematics of culture into discussion in formal education and open the door for several search and research in connection to socio-cultural basis for mathematics education. Likewise, Cole (1996) encouraged workers in socio-cultural studies of education to combine their research with that of researchers in other disciplines to study from a cultural-historical perspective. A number of international ethnographic studies suggest the importance for a Vygotskian theory of learning, looking closely at the issues of social relations, including power and conflict in the dynamics of institutional learning. In Nepal, since 2005, some researches appeared from the researchers of Kathmandu University and Tribhuvan University on socio-constructivist theory and using ethno-mathematical approach in mathematics classroom. These types of contents are kept in the pedagogical courses in B. Ed and M. Ed curriculum. But it is seen especially in the private boarding schools that the anthropological aspect are about to neglected. The students could not take advantage through the theories of socio-culturalism and ethno-mathematics. For example; a student of boarding school rarely says that a glass is a frustum of a cone (an experience of a quiche contest in a boarding school of Butwal by the author, 5th, September 2019). For some years, large population from the hilly districts and rural areas has been migrating to urban areas in Butwal like cities. They are from different socio-economic status and cultural background. Most of the guardians enroll their children in boarding schools. But the students from village find themselves are in minority in private boarding schools. In a context of informal discussion, one of the guardian who was migrant from Arghakhanchi asserted that school administration and the mathematics teachers did not notice the voice of children who were new comers from villages and remote areas. This was one of the representative voices of migrated guardians. Not only by guardians, researchers also worried that mathematics teachers of Nepal have not practicing ethno-pedagogical strategy in teaching mathematics. In this circumstances, Devkota (2013) published a research article on titled "Ethno-mathematics and Multiculturalism" and articulated "if we respect multiculturalism and if teachers and educators are trained to

respect cultural diversity, 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". This utterance of Devkota has a great importance on the sector of epistemology.

Furthermore, I studied the theory of education by Paulo Freire. In Paulo Freire's educational theory, there are eight sub-theories named; theory of value, theory of knowledge, theory of human nature, theory of learning, theory of transformation, theory of society, theory of opportunity and theory of consensus. On the basis of these theories, Freire wrote the book named "Pedagogy of the Oppressed" as teaching strategy. Among these eight sub-theories, I chose, three; theory of society, theory of opportunity and theory of consensus. Reviewing the literatures of Vygotsky, Freire and thae article of Devkota, researcher made a baseline of analyzing this study to humanize Nepali mathematics teaching and learning strategies. It is my concern to study the issue whether students' emancipation is necessary from authoritarian teaching strategy especially in boarding schools of Nepal.

Research Questions

- What are the basic tenets of Vygotskian socio-cultural theory and Freire's educational theories in relation to mathematics education?
- To what extent are socio-cultural theory and ethno-mathematics applied in private boarding schools?
- What steps need to be employed to improve mathematics education from anthropological lens in private boarding school?

Methodology

This study is the review of Vygotskian socio-cultural theory, Freire's educational theory and Devkota's research article on "Ethno-mathematics and Multi-culturalism". I had presented different ethno-mathematical cases noticed by Devkota and me, and reflections of principle, mathematics teacher, guardian, student of boarding school and my own experiences interacting and interviewing swith students and teachers during my professional life based on the educational practices in relation to mathematics education in different parts of Nepal. The reflection of boarding school's Principal, a neighboring child of boarding school, perception of a migrated student, a mathematics teacher of boarding school, a guardian of boarding school and mine experience in an interview with mathematics teacher were the subjects of expressions in this article. This study followed qualitative approach in transformative world view. Transformative worldview holds that research inquiry needs to be intertwined with politics and a political change agenda to confront social oppression at whatever levels it occurs (Mortens, 2010). Transformative research methodology with critical inquiry contains an action agenda for reform that may change lives of participants, the institutions in which individuals work or live. Creswell (2014) states that specific issues need to be addressed that speak to important social issues of the day, such as empowerment, inequity, oppression, domination, suppression and alienation. This type of worldview provides the voice for these participants, raising their consciousness or advancing an agenda for change to improve their lives. This worldview is suitable for critical inquiry in interpretive research design.

Analysis

Students in boarding schools face several different learning problems than the students in public schools. First, the application of learning habits and facilities that tend to be the same will raise problems in learning skills, especially mathematics (NCTM, 2000). Second, some children are used to indirect learning, some are used to direct learning. Third, some children with certain mathematical initial abilities have a complete scheme, some do not. Finally, some children usually learn with certain learning styles that require different facilities and approaches but in boarding schools their tendency to be treated equally both in class and outside the classroom.

Sharing his experience as a mathematics teacher of Nepal, Devkota (2013), in his research background states;

After attending many classes in "Diversity Education", in my M.Phil. 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.

There is the same case of teaching and learning mathematics in lower school level. Most of the teachers are using authoritative teaching in a formal approach. They do not use socio-cultural theories and constructivist approach in mathematics teaching. For some years, large population from the hilly districts and rural areas has been migrating to urban areas of Nepal. They have been migrating by different reasons such as for their security, seeking job opportunities, seeking better institutions for education to their children and so on. They are from different socio-economic status and cultural backgrounds. One generation at the age between 25-45 has an experience that their parents did hard labor for hand to mouth. This generation wants to release from the hard work that their parents did for living. This may be one of the reasons of migration to educate their children in better educational institutions. By this fact, they chose so called popular boarding schools. These types of boarding schools have aims of securing good achievement through passing out large number of students especially in SEE and 12th grade. In an interview, I asked to the Principal and the mathematics teacher of a boarding school at Butwal and got answer as follows;

The teachers are always in pressure for finishing their course in targeted time. For this purpose, they apply other pedagogical approach rather than constructivism. They have no time of understanding different socio-economic and cultural backgrounds of the students.

The challenge of learning mathematics is a specific subset of learning. For a comprehensive hypothesis of learning mathematics, the teacher should delicate to classroom setting, culture and social contrasts. He/she should have the knowledge; of the fact that learning is a procedure that happens not just in the mind or even in the living being of a solitary person or consider it to be a procedure of progress

in the person in collaboration with the social and ecological settings. But what types of teaching learning environment is seen in Nepali schools? As a mathematics educator, I also have long experience of more than 35 years in this sector. I observed many classes of the pre-service and in service teachers and found that the teaching pedagogy of mathematics is as like a banking education system as Paulo Freire states. Education must begin with the solution of the teacher-student contradiction and conflict. This solution is not found in the banking concept. On the contrary, banking education maintains and even stimulates the contradiction through the following attitudes and practices, which mirror oppressive society as a whole that Freire articulates:

- (a) the teacher teaches and the students are taught;
- (b) the teacher knows everything and the students know nothing;
- (c) the teacher thinks and the students are thought about;
- (d) the teacher talks and the students listen—meekly;
- (e) the teacher disciplines and the students are disciplined;
- (f) the teacher chooses and enforces his choice, and the students comply;
- (g) the teacher acts and the students have the illusion of acting through the action of the teacher;
- (h) the teacher chooses the program content, and the students adapt to it;
- (i) the teacher confuses the authority of knowledge with his or her own professional authority, which she/ he sets in opposition to the freedom of the students;
- (j) the teacher is the Subject of the learning process, while the pupils are mere objects.

This is the real picture of most of the boarding schools of Nepal. The boarding schools of Butwal also are not got rid of this type of pedagogy.

Considering these facts, I was driven basically to the socio-cultural learning theories of Vygotsky, crafted by Lev Vygotsky (1934) has become the established theory in psychological improvement in the course of recent decades, especially of what has gotten known as socio-cultural theories. Socio-cultural theory sees human advancement as a socially interceded measure in which children secure their social qualities, convictions, and critical thinking methodologies through community oriented exchanges with more educated citizenry. Vygotsky's theories stress the key job of social cooperation in the advancement of comprehension (Vygotsky, 1978), as he accepted that network assumes a focal job during the time spent "making meaning". Most mathematics teachers (basically boarding schools) in Nepal consider formal mathematics as mathematics but they are mostly unaware that mathematics has come as part of human civilization as well is part of the context of the local culture and community as well. The most challenging part of this stage was to create clear pedagogical distinctions between culturally relevant pedagogy and other established pedagogies in the instruction. In relation to the pedagogical work developed in schools, the "views of pedagogy within the literature on ethno-mathematics are compatible with work on culturally relevant pedagogy" (HART, 2003, p. 42), which examines the cultural congruence between students' communities and schools. In this context, it is suitable to share the experience of mine below:

I have an experience of high school level mathematics teacher's interview being an expert when I was teaching in

Surkhet campus. I asked a question to Madan (pseudo name);

Me: Sir, do you bring quadrilateral from office to classroom?

Teacher: Yes sir, I easily do it.

Me: Do you have some knowledge of 2-D and 3-D?

Teacher: Yes sir, I have.

Me: But how can you bring 2-D material in class?

Teacher: Umm, sorry sir. (10th Jan, 1995 in Surkhet)

Many teachers of mathematics of Nepal have a problem like this. It is my experience in my class till now. They see mathematics is far from human life and do not contextualize situation, culture and society. This may be the reason of underestimating zone of proximal development as Vygotsky stated. Zone of proximal development is not only for students, it is important for teachers. Teachers also should have support (in Vygotsky's term 'scaffolding').

Vygotsky states the significance of social and social setting for learning. Psychological improvement originates from social connections from guided learning inside the zone of proximal advancement as kids and their accomplice's co-build information. Through connection inside the socio-cultural condition, these are formed into more modern and powerful mental cycles which Vygotsky alludes to as 'higher mental capacities.' Each culture provides its children tools of intellectual adaptation that allow them to use the basic mental functions more effectively/adaptively. 'Tools of intellectual adaptation' is Vygotsky's term for methods of thinking and problem-solving strategies that children internalize through social interactions with the more knowledgeable members of society. But when I ask questions to my neighboring student Radha (pseudo name) as she has been studying in a boarding school of Butwal like this;

Me: Do you solve this type of simultaneous equation of two variables?

Student: Yes, uncle.

Me: Solve then; $2x+3y=5$
 $3x+4y=7$

Student: Showing the solutions; $x=1$ & $y=1$

Me: you are right. But what is the meaning of getting the values of $x=1$ & $y=1$

Student: Umm,(she has no answer). Sorry uncle. (19, Feb, 2020, Tilottama-3)

It means she has no perception of straight lines and algebra is not associated with geometry. The teacher has not taught that the values of x and y is the position of two intersecting lines. Teacher teaches equation and students learn equation but do not know the meaning what it is. How can we improve our pedagogy? Until and unless we tie up our mathematics with real meaning, our culture and context, it will not improve.

According to D'Ambrosio (1985), human civilization and the history of mathematics have strong relationships. In this context, history of mathematics can hardly be distinguished from the broad history of human behavior in definite regional contexts, recognizing the dynamics of exchanges, and this is fundamental as well for mathematics education in

diverse contexts. Every small community has its own values and practices that allow children to survive and effectively flourish and develop into successful adults. We have historical and monumental national and local glorious assets in our community. To what extent are our mathematics teachers bridging mathematics class to diverse civilizations, history and culture? Do they use dialogues, interactions and critical pedagogy in classrooms?

In the teaching and learning mathematics in the context of Nepal, being a mathematics teacher; Devkota (2013) in his article articulates;

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 Nanglo (Tras. a circular disc made by using bamboo and widely used in sheaving purpose) is an example of circle. If I say Nanglo 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.

What is the semiotic meaning of our teaching of mathematics? There is a great relation between socio-cultural theory in mathematics teaching and ethno-mathematics. 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). We have many examples like Devkota illustrated in mathematics classroom but our mathematics teachers do not use these examples. One can conclude that the mathematics that has arisen from cultural practices is ethno-mathematics and there are various benefits of such ethno-mathematics 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.

Devkota further asserts;

Nepal is a country having different aspects of multi-diverse and multi-culture and great math can be constructed by such multicultural and Ethno-mathematics 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.

We Nepali teachers are following west but Nepal itself is rich country in ethno-mathematical perspectives. Students have the empirical knowledge of Doko, Dalo, Ghaito, Surai, Palang, Chakati, Pirka, Halo, Juwa, Madani, Theko, Khatiya etc. Girls students have a knowledge of kitchen utensils like; Thal, Kachaura, Glass, Amkhora, Bottles and so on. Students from carpenters have ideas of carpenters' tools. A house of hilly

designed may be the good example of different geometrical ideas. There are many utensils for measuring solid and liquid things in our homes. We can see different geometrical shaped objects in our society in temples, gumbas and Masjits. A Brahmin draws a geometrical figure named Rekhi at first when he is going to start Puja. We can see different examples of ethno-mathematics in Rigveda from the Hindu religious perspective. But the scenario is that mathematics is far from the social-cultural context. Students who are talent and grasp abstract part of mathematics are only benefitted from mathematics teachers. So, socio-cultural theory is the emerging aspect of teaching school mathematics where teacher can use ethno-mathematics. The learner is not a mere receptive or passive party in our view. Hence, learning theories which situate the learner and the learning process in contexts will carry our attention, and we will disregard the other ones. In a very general sense, we should follow Cole's (1996) synthesis in this respect. In Vygotsky's (1962) intriguing approach of almost a century ago, learning was first and foremost understood as a dialectical process between a learner and his or her environment. When we put the learner in the focus, it follows that we need to take attention of anthropological aspects in mathematics education. Learner brings a background of knowledge into the learning situation: he/ she already have knowledge which is relevant for the issues or the problems presented in the school setting. E.g., each child has a mental map of the environment, which will allow to cover the distance between school and home in a rather efficient and safe way. At the same time, the child has a foreground of knowledge, which is the set of extensions of the knowledge that is acquired together with the skills to enable further learning. E.g., understanding of the school culture, management of problem solving techniques regardless of concrete contexts, and so on are examples of this. The child is actively learning in a classroom while making use of this mental setup.

On the other side, Paulo Freire's critical pedagogy is the one of the most important theory of education in teaching and learning process in the 21st century. Critical pedagogy can be defined as a teaching and learning method that intent to liberate, emancipate, and contribute to a more social world. The advocate of critical pedagogy reject the idea that knowledge is ever politically neutral and argue that teaching is an inherently political act, whether the teacher acknowledges that or not. In his book entitled, "Pedagogy of the Oppressed", he emphasizes mostly on problem posing education, liberal education, genuine dialogical education, transformative education, conscientization, and reflection and action also known as praxis in his critical education. But the irony is seen Nepal that these types of pedagogy are not in practice. Devkota says in his article;

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. Due to political influence in policy level, only socio-economically sound people are benefitted and mathematics is molded towards their own wish.

Devkota's argument claims that there should be a bridge to meet the disadvantaged pupils and socio-economically sound pupils. Although, educational institutions are not classified on the basis of economic hierarchy of the students

according to the government policy, the pedagogy used by mathematics teachers seems that they are applying old humanistic pedagogy in the sense of Ernest (1991). The learner is not a mere receptive or passive party in our view. Private schools just want their students to engage in studies hoping they would score a good percentage when their mind is directed towards a thing; study and percentage are all the matters to them. Also, they get highly theoretical and unswerving in their teaching. As a result, the overall development and improvement of the student lack. This is beyond the theory of equity in education, i.e. opposite of Freire's theory of education. What are the reflections of students in learning mathematics in boarding schools? A representative response of a student of boarding school studying 8th grade named Mina (pseudo name) is below:

Me: How many utensils in your kitchen can you see as examples of circle?

Mina: Circle? In kitchen?

Me: yes, are the circles in your kitchen?

Mina: Sir, I can't say. My mathematics teacher had taught the definition of circle and its components. (Interview with a girl on 24, October, 2019)

This saying of mina represents that mathematics teacher of her did not use ethno-pedagogy in his class. As a teacher educator and researcher, I asked a guardian of boarding school on the performance in mathematics who was migrated from Palpa and enrolled his son in a boarding school. His qualification was B Ed and knows the contents of mathematics of eighth class:

Me: How is your child's performance in mathematics?

Guardian: He is normal in arithmetic and algebra but weak in geometry.

Me: What does he say about geometry?

Guardian: He states that he has to rote definitions of geometrical terms and felt difficulties in proving theorems.

Me: Have you complained to mathematics teacher and Principal?

Guardian: Yes, I did but they told to make my child doing hard labor in mathematics since by nature of mathematics, it is abstract.

Me: You are B Ed and have some knowledge of pedagogy, do you predict the weaknesses of using pedagogical strategies by mathematics teacher?

Guardian: It may be but I am unknown about it.

Me: What is your son's reflection on learning geometry?

Guardian: He says, geometry is abstract.

Obviously, we can predict that the mathematics teacher of that boarding school does not connect geometry with real world. Students are not able to meaning making. Perhaps, he is using authoritarian approach in teaching and does not contextualize geometry with society. But he may have the illusion of better teaching and adopting equal opportunity to all students to learn. In this context, it is appropriate to remember Gadotti because all students in the class have not the cognitive ability to grasp abstract mathematics. As teacher has an illusion of delivering content to all students treating equality. Gadotti (2012) also accepts Freire's principle that education is not a neutral process. Paulo Freire challenges the conventional assumption that there is an equal opportunity in a democratic society. He asserts, often, that education is a political process. Schools become the

tools that are used by parents, business and community to impose their values and beliefs. While no intentional harm is intended, this process often results in the operation of less privileged persons. He adds that it is truly difficult to make a democracy (p.67). Addressing the authoritarian teachers he adds;

As one might expect, authoritarianism will at times cause children and students to adopt rebellious positions, defiant of any limit, discipline, or authority. But it will also lead to apathy, excessive obedience, uncritical conformity, lack of resistance against authoritarian discourse, self-abnegation, and fear of freedom (p.40).

The above assertion of Freire is on the opposition of authoritative teaching. The social constructivism denies authoritative teaching. The pedagogy of mathematics that most of the teachers of Nepal are using the same authoritative pedagogy. In the sense of Freire, our students are being oppressed by educational institutions and mathematics teachers. Freire inspires those oppressed people to argue; thinking that disagreement is normal and something to expect. Disagreement can be an impetus to reflection and a source of growth. He adds that the problem is when opinions and disagreements are suppressed in the name of control and authority. Freire (1972) also argues that education should raise the awareness of the students so that they become subjects, rather than objects of the world.

Discussion

In Vygotsky's (1962) intriguing approach of almost a century ago, learning was first and foremost understood as a dialectical process between a learner and his or her environment. Vygotsky and his school broke the S-R approaches and situated the learning processes plainly in the field of interaction between a learner and the physical, social (historical) and cultural environment or set of contexts. Such a focus has tremendous consequences for education. Moreover, the socio-cultural perspective of ethno-mathematics provides us with an integrative approach to the school curriculum, which in addition to considering it an etic (outsider) approach to mathematical knowledge, recognizes what is truly necessary in the context of the emic (insider) characteristics of the knowledge.

As being the diverse classes in urban private boarding schools in Nepal, the institution have a concern of study and percentage of the students. Students are only passive listeners and cannot raise questions on the pedagogical strategy of mathematics teachers. Teachers do not have chance to study the socio-cultural background of the students. From which society, religion, professional background they came is not the issue of mathematics teacher. They look mathematics from unidimensional lens and follow Euro-centric pedagogy in teaching. They look mathematical formulas are perfect, the methods they use are unquestionable, the algorithms are certain. They see mathematics from positivistic lens. They do not see the connection of mathematics with the society. They use various hegemonic practices of decontextualized mathematics in class. As a result, mathematics becomes an abstract subject to students. Students in boarding schools, if not noticed, students will continue to accumulate learning

difficulties. Learning difficulties will lead to poor self-perception. This poor perception can lead to academic and non-academic problems. Apart from that, learning difficulties not only result in mere learning achievement but also on social relations (Octyvera, Siswati, & Sawitri, 2010). Therefore, guidance is needed with a multicultural approach (Bunu, 2016). With this approach, it is expected to make the learning atmosphere more meaningful.

If not possible, to avoid this type of indoctrination in mathematics teaching, students should have a dare of raising voice to the school institutions and mathematics teachers. They should not be silent in the name of authority, discipline and morality of the school. As Freire asserts that the ability of humans to plan and shape the world for their future needs is what separates man from animals. The oppressed majority must be taught to imagine a better way so that they can shape their future and there by become more human. New comers migrated students think that mathematics they have been learning is not humanized. To humanize mathematics, teachers must contextualize mathematical content anthropological perspective. For this purpose a movement with a voice of humanizing mathematics is necessary from the side of guardians and pupils against school authority and mathematics teachers. If this is done, it ensures the change of pedagogical approach of mathematics teaching.

Conclusion

Human beings have developed and continue to develop, in every new experience and in diverse cultural environments, their ethno-mathematics. Students pertain to the development, transmission and distribution of mathematical knowledge as dynamic processes embedded in their socio-cultural context. Nepal is a multi ethnic, multi religious and multicultural country. By the geographical, environmental and ecological diversity, students have different life experiences. For the better opportunity and better education, the migration rate has been increasing from rural to urban areas. With the migration, the enrolment of students in private boarding schools has been increasing. However, mathematics teachers have trained through the course of diversity in mathematics classroom and ethno-mathematics in mathematics class, they are not practicing and do not teach mathematics through anthropological perspectives. As the result, students feel mathematics as abstract subject and far from society, religion and profession. This era is constructivism era from the lens of pedagogy. Through the indoctrination pedagogical approach, mathematics teachers are colonized and are in the great influence of Euro-centric mathematics as D'Ambrosio says. As being Nepali people, we are rich in ethno-mathematics and can explore mathematics inside and outside the classroom. Of course, there are several opposing forces to the development of a good education system. In fact, in a developing nation, they are supposed to prevail. Ethno-mathematics is not to be confused with a subfield of mathematics education, designed to improve school mathematics, but as a political space where new forms of emancipation can be thought and practiced. Hence, I can conclude that the mathematics that has arisen from cultural practices is ethno-mathematics and there are various benefits of such ethno-mathematics which increases creativity, ability and way of thinking of learners, teachers as well as in the context of education. Hopefully, the

reforms to the pedagogical system would take place quickly. Otherwise, students should have the dare of standing in opposition of mathematics teachers and private boarding institutions as Freire articulated for the emancipation.

References

- [1] Bishop, A. J. (1988). The interactions of mathematics education with culture. *Cultural Dynamics*, 1(2), 145-157.
- [2] Cole, M. (1996). *Cultural psychology: A once and future discipline*. Cambridge: Harvard University Press.
- [3] D'Ambrosio, U. (1990). The History of Mathematics and Ethno mathematics. How a Native Culture Intervenes in the Process of Learning Science. *Impact of Science on Society*. 40(4), 369-377.
- [4] Devkota, S. P. (2013). Ethno mathematics and multiculturalism. *Open Science Repository Mathematics*, Online (open-access), e70081969. <https://doi.org/10.7392/openaccess.70081969>
- [5] Ernest, P. (1991). *The philosophy of mathematics education*. London: Falmer Press.
- [6] Freire, Paulo (1972), *Pedagogy of the Oppressed*. Harmondsworth: Penguin
- [7] Lave, J. (1988). *Cognition in practice. Mind, mathematics, and culture in everyday life*. Cambridge: Cambridge University Press.
- [8] Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- [9] Mesquita, M., Restivo, S., & D'Ambrosio, U. (2011). *Asphalt Children and City Streets. A Life, a City and a Case Study of History, Culture, and Ethno mathematics in São Paulo*. Rotterdam: Sense Publishers.
- [10] Piaget, J. (Ed.) (1972). *Structuralisme et épistémologie génétique*. Paris: Pléiade.
- [11] Pinxten, R., van Dooren, I., & Harvey, F. (1983). *Anthropology of space*. Philadelphia: University of Pennsylvania Press.
- [12] Rosa, M., & Orey, D. C. (2009). Symmetrical freedom quilts: the ethno mathematics of ways of communication, liberation, and art. [Os quilts simétricos da liberdade: os modos etnomatemáticos de comunicação, libertação e arte]. *Revista Latinoamericana de Etnomatemática*, 2(2). 52-75.
- [13] Rosa, M., & Orey, D. C. (2011). Ethno mathematics: the cultural aspects of mathematics. [Etnomatemática: os aspectos culturais da matemática]. *Revista Latinoamericana de Etnomatemática*, 4(2), 32-54.
- [14] Vygotsky, L. S. (1962). *Thought and Language*. Cambridge, Mass.: M.I.T. Pres.
- [15] Whitehead, A. N. (1906). On Mathematical Concepts of the Material World. In *Philosophical Transactions of the Royal Society of London, Series A, Mathematical and Physical Sciences*. Volume 205 (pp. 465-525). London: Published for the Royal Society by Dulan.
- [16] Hendrayana, A., Mutaqin, A. & Syamsuri, S. (2019). The Phenomenon of Boarding School and Its Mathematics Learning. *Al-Jabar: Jurnal Pendidikan Matematika*. 10. 159-175. 10.24042/ajpm.v10i1.4104.
- [17] ROSA, Milton; OREY, Daniel Clark. Ethno mathematics: connecting cultural aspects of mathematics through culturally relevant pedagogy. *Mathematics Education & Society*, v. 8, n. 3, p. 887-897, 2013.
- [18] SHARMA, Toyonath; OREY, Daniel Clark. Meaningful Mathematics Through the Use of Cultural Artifacts. In: ROSA, Milton; SHIRLEY, Lawrence; GAVARRETE, Maria Elena; ALANGUI, Wilfredo V. (Ed.), *Ethno mathematics and its diverse approaches for Mathematics Education*. Cham, Switzerland: Springer, 2017, p. 153-179.
- [19] Freire, P. (1972). *Pedagogy of the oppressed* ; translated by Myra Bergman Ramos ; introduction by Donaldo Macedo.—30th anniversary ed. p. cm.