Teaching Learning Mathematics in Multi-cultural Classroom

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Abstract

In the multicultural classroom, students come from many different backgrounds, experiences, and ethnicities. As a result of poor performance in traditional mathematics assessments, teachers often believe English language learners to be weak students. This study aims to unveil the experiences of mathematics teachers while engaging students in multicultural classrooms and describing their ethnic and cultural influence in primary level mathematics teaching in the context of Nepal. The study focused on finding the reasons of the irregularity of the students, the use of their non - contextualized vocabularies and various other challenges faced by teachers in a multicultural classroom. This study underpins qualitative research design under which I applied phenomenological approach and in-depth interviewed six primary level mathematics teachers in Kirtipur Municipality. The data management was conducted through thematic analysis. The main finding of the study is that the teachers used different strategies that allowed the students to reason and communicate mathematically and develop students' abilities to solve problems. They acted in playing the role of facilitators to accomplish their professional responsibility. The study also revealed that the students, teachers, parents, environment and national policies are all responsible to influence the learning activities of the students. Moreover, teachers' experiences help in motivating the learners and promoting the teaching learning activities in the multi-cultural classroom.

Keywords: Culture, ethnic, experience, language, motivation, perception

Introduction

Nepal is a multicultural, multiethnic and multilingual country that has a great linguistic diversity. Yadava (2007) claims that 104 ethnic languages are currently spoken in Nepal and that they come from four different language families: Indo-European (Indo-Aryan), Tibeto-Burman, Austro-Asiatic, and Dravidian. The population census of 2011 has listed 123 identified languages and the other unidentified languages. Lewis (2009) has recorded that 126 languages are spoken in Nepal. Yonjan (2005) argues that 144 languages are spoken within the territory of Nepal (as cited in Bishowkarma, 2020, p. 8). This shows

that Nepal is a rich country of languages, cultures, and ethnic groups where we get diversities within territories. People are living all over of the country defending Nepal's independence, sovereignty, geographical integrity, national unity, freedom and dignity.

The existing linguistic diversity in the Nepalese communities divulges as a jeopardizing communication between different speech communities. The Constitution of Nepal, 2015 has made guarantee of the students' about getting their education in their mother tongues (Nepal Law Society, 2015). Similarly, the current Education Act, 1971 has also ensured the learners to receive the basic level education in their mother tongues (EDUCATION ACT, 2028 (1971)). Likewise, the Language Commission [LC] 1991 has also promoted to impart the education in learners' mother tongues. So to support this spirit more than 26 types' learning materials on different mother tongues have been prepared up to 2020 throughout the country. It is obvious that the students can effectively learn the content based knowledge with the help of their mother tongues as the medium of instruction.

Mathematics is one of the important disciplines that directly or indirectly relates to our life. Therefore, it is essential to study. Education helps a child to become a useful and responsible member of the society which is the greatest force for the development of a nation economically, socially and culturally (Pokharel, 2018, p. 11). Moreover, mathematics has been used in every sector of education. Without the knowledge and use of mathematics, no one can move one step further in his academic and practical life. We cannot have any idea to connect new things and objects which is useful in our daily life (Wanamaker, 2018). Mathematics is one of the greatest cultural and intellectual achievements of human-kind, and people should develop and appreciate the understanding of that achievement, including its aesthetic and even recreational aspects (NCTM, 2000, p. 4). It also helps people in transmitting and enriching their culture due to the impact of globalization. Culture as the ways in which a group of people make meaning of their experience through language, beliefs, social practices and the use and creation of materials (Banks, 2006). Therefore, mathematics is an important subject for all human beings to run their life smoothly and successfully.

Mathematics constructs different materials on different cultural phenomena which assist to connection relation among them and transfer of knowledge. From mathematical viewpoint, there are various communities and their civilizations (Acharya, 2015, p. 40). The use of mathematics is multi-disciplinary and versatile. It also says that mathematics is deeply linked to culture and hence it cannot be isolated from social, political and economic factors of the present world. It is where the ethno- mathematics is different because, it is a cultural group's mathematics (D'Ambrosio, 1984).

In other words, ethno- mathematics examines how different cultural groups use mathematics. This justifies the study of mathematics is rational around different dimensions.

Acharya (2015) did a research on "Relevance of primary level mathematics education in Nepal: A cultural perspective" in Kathmandu valley. The purpose of the study was to

examine the existing primary school mathematics curricular materials from the cultural perspective, to assess the culturally relevant pedagogy used by mathematics teachers in multi-cultural classroom at primary school level, to explore the difficulties faced by the teachers and students of different cultural groups in teaching and learning mathematics, and to examine and suggest the possibilities of making primary level mathematics education culture friendly. In his invention, he committed that he could not address the influence of mother language and inclusive classroom practice issues in teaching-learning activities. I saw a gap in his study and determined to carry out this study on "Students' Teaching Learning Mathematics in Multi-cultural Classroom".

The purpose of the study is to explore the experiences of mathematics teachers about engaging students' in multicultural classroom and to identify the languages, ethnic and cultural influence at primary level mathematics teaching in the context of Nepal.

Methods

This study follows qualitative research design. Qualitative research concerns with social phenomena as they occur naturally. It makes emphasis on unique case orientation and aims at description, exploration and discovery using 'wide-angle' and 'deep-angle' lens approach to examine the breadth and depth of phenomenon (Koul, 2009, as cited in Acharya, 2020, p. 225).

For the data of my study, I purposively selected six schools of Kirtipur Municipality. I applied phenomenological approach and took in-depth interview with six primary level mathematics teachers from those schools. Interviews were recorded with the permission of the participants and primary coding was made through information of the study for the purpose of analysis of data.

After transcribing the interviews, the participants were made more credible by their statements. The names of the participants were kept confidential and pledged not to misuse the interviews. This study has delimitation that only focused multi-lingual and multi-cultural teaching and learning practices in primary level schools in Kirtipur, Municipality.

Results and Discussion

I arrived at the following findings which were classified under the following sub-headings, and discussions have been made accordingly.

Influences of language and culture in learning

The role of language is prominent in teaching and learning of mathematics (Huang & Normandia, 2007). Language plays an important role in facilitating the learning and understanding of mathematical concepts in multi-cultural and multi-lingual classrooms. Participant A argued that teacher has the knowledge of every area and of language. According to the caste, the mother tongues of the children are different. Therefore, the classroom learning activities of the students depends upon languages that the students and teachers use.

Language of the students determines many things related to culture, ethnicity, society and community. Participant A claims the teaching and learning process becomes joyful with Nepali and English medium multi-lingual and multi-cultural students. Especially, Tamang community students are dominant in her classroom and they speak Tamang language dominantly. They do not understand and speak the other languages. Therefore, she feels difficult to teach them in both Nepali and English mediums. Moreover, she said *I am striving to speak Tamang language well. I speak Tamang language as I know. After that I translate Tamang into Nepali language for increasing students learning.* Therefore, the language of the teacher plays vital role for conducting the active participation and effective learning of the students.

The language differs according to different ethnic groups where each ethnic group is striving to preserve their own language and culture to meet their need in the global context. Language is used to express mathematical ideas and link mathematical relationships and patterns (Han & Ginsburg, 2011). Moreover, the achievement of the students increases through the use of mother tongues in primary level. It is proved that teaching learning activities heavily depend upon the ethnic beliefs and cultural values of the students.

Teacher's role in effective classroom management

Teacher is a key person in the classroom to make teaching and learning activities more effective and interesting. Teacher always thinks about appropriate methods, techniques and strategies to conduct in the classroom. Teacher is a person who artistically solves the problems in his classroom and gives solutions. According to participant A, the role of teacher seems as a guide as well as a counselor in class and implements the classroom activities effectively even in multi- lingual and multi-cultural societies. Bartell (2011) says that teachers are most aware of their students' problems who act as facilitators and co-workers in the classroom activities.

Park (2001) has mentioned that teacher helps in meeting the learning needs of the students using the multiple learning opportunities (Khanal, 2015, pp. 3-4). Participant A said that teacher has a vital role and responsibility in improving classroom teaching. All participants said that the role of teacher should be as a good facilitator to promote learning activities. Participants D and F assert that their challenge is making their students be regular in their classes and complete their home works. Teacher explores the level of the students and encourages them to actively participate in their classroom activities.

Teacher involves in case studies in micro-level to know the learners' learning levels. Participant E views that the teacher knows the individual levels of their students and therefore addresses them properly. Every child needs individual care by his parents and teachers. According to Stellwagen (2001), the primary role of teacher is to recognize the different potentialities of the students (cited in Khanal**,** 2015, p. 54). Teacher studies child psychology of the students and actively assists to engage them in learning.

Mathematics classroom should be attractive through the use of innovation materials. Teacher encourages the students to construct learning materials as far as possible from local raw materials. Kay (2001) has suggested that teaching aids make teacher feel easy, make teaching effective and motivate the students to learn actively (cited in Khanal, 2015, p. 53). Teaching materials are the main tools of learning. Participant A uses available local instructional materials to teach arithmetic. She sometimes collects small stones and observes the classroom activity of the students counting them. Participant B argues that the act of transferring the mathematical concept is extremely difficult. She asserts that the teacher can teach mathematics easily by the act of linking the mathematical concepts to the practical life. Group work, interaction and discussion help in collaborative learning that can increase innovative teaching materials and build concepts in the students.

The use of modern technology helps in better teaching and learning. Participant D said, audio-visual materials are used for making mathematics class interesting. ICT is a necessary tool for promoting effective teaching learning activities in mathematics. Wang et al. (2016) has asserted that the achievement of project based learners is higher than the ordinary learners. Participant F has found that the learning achievement of the students is higher by using audio-visual materials in projector of Midas. According to Wallace and Louden (2003), the use of educational media such as computer assists to improve the effectiveness of the instruction (Khanal, 2015, p. 53). Therefore, we have to link the students with concrete, semi-concrete and symbolic objects which help them to construct innovative new teaching materials for effective teaching.

Classroom teaching activities should be attractive and interesting for learners. Positive thinking gives energy to the students for learning and negative attitude appears to relate poor performance (Kennedy, 2019). Participant A said *Students should be connected with prior knowledge*. In the learning process, starting from solid, after that semi-solid and gradually abstract concepts are connected to mathematics teaching and learning in classroom.

Students are motivated to learn actively, when teacher uses joyful learning methods through simple to complex and focuses on creativity in mathematics. Banks (2006) argues that the multicultural students can be motivated through culturally responsive teaching methods, instructional materials, group assignments, positive reinforcement, and selection of contents with the interest of learners, continuous evaluation and extra-curricular activities (cited in Acharya, 2015, p. 338). Participant A explores that student should be motivated to learn mathematics including other subjects. According to the Callahan et al. (2002), teachers modify their teaching styles and teach a wide repertoire of strategies (as cited in Khanal, 2015, p. 20). Sometimes, students are not ready. They make noise and start crying which creates problems. Teacher should connect her teaching strategies with their daily life; she can effortlessly establish interest in her class.

Experiences and challenges in Mathematics teaching

The experience of teacher in a multi-cultural classroom is vivid and interesting. Experience of the teacher assists to improve learning activities of the students and provides way out to solve the problems through developing new strategies. Participant B said *I feel teaching and learning process easy because multi-cultural and multi-lingual students are coming in the school*. Generally, all students speak Nepali well in school. Also, participant E said i*n my class, I teach many students with different mother tongues and cultures by using a common method. If they don't understand, I use their mother languages and materials which they gladly accept to learn easily*. Participant F said *I feel difficult to teach mathematics to such type of children together in class. To make weak students learn actively I always care them and put them together intelligent students group*. As individual differences, the experience and classroom practice seems different but joyful.

Effective classroom teaching influences teacher and students over long time. Some events are memorable developed at the instant of classroom teaching. Teacher remembers these events even long later. Participant A explored a memorial event when she was teaching in her class. First of all, she made her students ready and engaged them in counting their own fingers, toes, hands and feet themselves. All students were expressing their pleasure to have counted their body parts. In the class, a little girl asked her the questions *why did our head make single miss*"? The environment of the whole class was funny. She (Miss) never forgot that interesting event created in her classroom. Participant B explores her teaching experience in teaching geometry portion to categorize the triangle on the basis of side and angle; teacher used potatoes and sticks as instructional teaching tools for constructing complete triangle; students felt joyful learning. In the next class, the students who did not have potatoes used muddy soil instead constructed a complete triangle. The teacher felt so proud and pleasure in that moment.

Mathematics is taken as a difficult discipline because the assimilation of mathematical concepts and transferring the mathematical knowledge do not seem to be smoothly going. Participant D has many memorial events in classroom teaching and learning activities. He remembers the event of conceptualizing odd and even numbers while teaching number to the students. In that instance, students actively participated in playing game and learnt number system in a joyful way. Vygotsky (1978) has stated that learning takes place in a social context and that interaction with others; learning in social context is zone of proximal development that advocates for cooperative efforts in the classroom.

Challenges in multi-cultural classroom Mathematics learning

Different challenges appear in the classroom related to subject matters, teaching methods and teaching learning activities. Teacher faces these problems every day and plans to normalize the issues with the solutions of classroom management (Acharya, 2015). Participant A said that teacher follows student centered learning activities rather than teacher centered. But the reality is we cannot ignore the dominance of teacher centered

activities in classroom teaching practices. Participant D said *students do not seem to be ready for learning but teacher is forcing them to learn. They remain in anxious situations every time.*

Mathematics is a difficult subject as per the perception of our society because most of the students secure low marks and fail in this subject. Participants C and D have faced the problem of regularity of the students. Both participants have felt that the learning achievement of the students depend upon the regularity of the students and their active participation in classroom activities. They have viewed that this gap of learning is due to irregularity of the students, low educational family status, and negligence of parents towards the caring of their children. Participant E has also the similar experiences to participants C and D. Participant E adds *parents' living standards and their economic and educational status has direct influence upon the learning activities of the children*. Moreover, the learning environment, teacher guidance, and national educational policy affect the learning activities in the classroom. Learner him/herself is a cause of learning because of his/her family background. Economic and the educational status of parents directly affect his/her learning activities (Neupane, 2010). Some children have easy access and some do not have it to buy learning materials and reference materials. The teacher focuses only on the fast learners. That is why, slow learners are victimized. It is the great challenge in the classroom to manage learning process. From this study I conclude that teacher knows the in-depth child psychology of the students and prepares the plan of effective classroom teaching.

Assessment and evaluation of the study

Evaluation is a systematic process of determining to what extent instructional objectives has been achieved. Evaluation is measurable and observable; evaluation shows the result of the task. Assessment is used in the sense of judging the level of students learning (Freeman & Lewis, 1998). In school level, continuous assessment is applied in basic level education. Unit test, terminal examination, project work, half-yearly exam and final examinations are the tools of evaluation. But in primary level continuous assessment is dominant than other tools of evaluation. The evaluation process directly links to local as well as national curriculum objectives. The curriculum influences the learning outcomes of the students and it is developed according to the child psychology. Participants C, D, E and F have responded *students from the Brahmin castes are more active and they have more achievement results*. Besides this, participants C, D and E have shown the high achievements of Kshhetries as the Bhahmin students' achievements. Participant E also talks about the high achievement of Madheshi. Likewise, the participants A, C and D have stated *students with Nepali mother tongues have higher learning achievement than the others.* Participant E has expressed the least achievement of Mangol community students. Participant F has stated that Praja caste students have low achievement. Participant C has explored that the Janajati students have low achievement. Participant E has felt *family environment and community environment affects the learning achievement of the students*. Participant B has felt that the learning ability and attitude determine the

learning achievement of the students. All these reveal that mother language and cultural practice much influences the achievement of the learners in primary level education.

Training and technology helps in promoting teaching and learning activities effectively. Training assists in gaining knowledge and recognizing child psychology of the students. Technology helps in increasing capacity of the user. According to Pandit and Neupane (2067), we must show our concern ourselves with the process and the product, then, how to teach and what to teach.

Collaboration learning and use of appropriate teaching materials assists in growing mathematics teaching and learning activities in primary level. Language is a medium of good communication and way of transforming knowledge. According to Linn and Miller (2008), the main goal of classroom testing and assessment is to obtain valid, reliable and useful information concerning students' achievement (as cited in Acharya, 2015, p. 291). Participant B has stated *teacher recognizes the learning level of the individual student and assists to teach him with his abilities*. She better knows how her students learn fast with their peer groups. Therefore, teacher manages the classroom for effective teaching and learning activities through collaboration and co-operation. Fast learners should help the slow learners to promote learning activities. Participant A creates peaceful environment and engages the student with the proper use of basic skills of language effectively. Thus child friendly environment and student centered teaching activities assures to promote mathematics achievement multi-cultural classrooms.

Conclusion and Recommendations

Nepal is a multi- ethnic and multicultural country. Every ethnic group has its own religious, social and cultural belief. Classroom management is one of the main aspects of effective learning. The management of furniture, light, classroom decoration, whiteboard and cleanliness play the vital role to enhance the mathematics learning. The equity culture of the school and its environment, local society, and educational policies influence learning activities and achievement of the students. Project work, collaborative, assessment and technology based learning provide pleasure to the learner. Motivation is a key component to engage students actively in classroom. Different researches show that learning of the child is more active and effective through mother tongues in primary level. Generally, English and Nepali are the mediums of teaching in Nepal. The family environment and culture of Brahmins and Chhetries more encourage their children in study. The Nepali language which is used in their home is the medium of instruction in school as well. Therefore, most participants find the achievement of the children of Brahmins and Chhetries seem significantly higher than the children of Janajatis and others. The teacher and school environment have played a crucial role for improving teaching learning activities of the students. Students, teachers and parents' roles should be tri-polar in relation. Teachers' experience helps in motivating the learners and promoting the teaching learning activities in multi-cultural classroom. Child friendly environment and student centered teaching activities assures to promote mathematics achievement multi-cultural classrooms. Teacher should connect her teaching strategies with their daily

life; she can effortlessly establish interest in her class. Teaching learning activities of the students also depend upon the ethnic beliefs and cultural values of the students. The teacher acts as a role of facilitator and co-worker in the classroom activity.

Different challenges appear in the classroom related to subject matters, teaching methods and teaching learning activities. Teacher faces these problems every day and plans to normalize the issues with the solutions of classroom management. Therefore, teacher should address different problems and challenges that appear in the classroom effectively and should aim at quality teaching and learning of Mathematics education. Training and technology helps in promoting teaching and learning activities effectively.

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