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Existence and Practice of Indigenous Mathematics in Karnali Province

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Abstract

This article is helpful to find the existing indigenous mathematics in Karnali Province and its practices at the secondary level school. Karnali province has its own indigenous culture and knowledge system. In Karnali province, Deuda, Mayur dance, Paiseri dance, Khando dance are the main dances and songs that can give the concept of mathematics. Many mathematicians have given contribution to the development of mathematics based on indigenous culture and practice. The researchers have selected ten secondary mathematics teachers purposively. Thus, focus group discussion was conducted to collect information of this study. It is concluded that existing indigenous mathematical knowledge and different occupations related to mathematical information should be used in teaching learning process at school level mathematics classroom. It is also found that there are different mathematical beliefs and practices in the different regions of Karnali province. This study is beneficial to the policymakers, curriculum designers, mathematics teachers and students, further researchers and learners as well. It is also beneficial for the teachers who want to make their teaching-learning activities alive in the classroom. Further, this article has social and cultural value in the real life situation of the learners. It helps to the teachers to teach Mathematics from the social and cultural perspectives in the classroom at any level.

Key words: *indigenous mathematics, mathematics education, culture and ethno mathematics.*

Introduction

Karnali Province is on of Nepal's seven federal provinces established by the country's new constitution, which took effect on September 20, 2015(Karnali, 2010).The province's entire size is 27,984 square kilometers (10,805 square miles), making it Nepal's largest province. It covers 18.97 percent of the country. Ten districts are located in Karnali Province (Constituencies & Constituencies, n.d.). According to the 2011 Nepal census, the province's population was 1,570,418 people, Nepal's least populous province. It is bordered on the north by China's Tibet Autonomous Region(Gesellschaft, 1974), east by Gandaki Province, west by Sudurpashchim Province, and south by the south Lumbini Province.

Birendranagar is the province's capital and largest city, with a population of 47,914. Khas Arya is the province's largest ethnolinguistic group.Chettri makes up most of the Khas

Arya in the province, accounting for 41.71 percent of the population. Other Khas Arya communities such as the Kami, Thakuri, Hill Brahman, Damai, Sarki, and Sanyasi make up 15.88%, 10.20%, 8.38%, 3.99%, 2.63 percent, and 1.69 percent of the population, respectively(Survey, 2016). With 95.34 percent of residents identifying as Hindus, Hinduism is the most widely practiced religion in the province. Buddhism is the most popular minority religion, with 3.09 percent of the population adhering to it. Christianity is the second most popular minority religion, with 1.30 percent adhering to it. The province's native language is Nepali, which is spoken by 94.70 percent of the population. Magar (2.06 percent) and Tamang (2.06 percent) are two more languages spoken in the area (0.69 percent)(Karnali, 2010).

Knowledge is described as familiarity with facts, truths, or principles gained by study or examination; erudition in general. It is based on learners' own experience, practices, and application in their life. The original knowledge of learners is indigenous knowledge.The Karnali province is rich in culture. The Deuda songs and dance, Mayur dance, Paiseri dance are cultures of Karnali. Agriculture, animal husbandry, and farming are the main occupations of Karnali peoples (NDRI, 2075BS). Pandit (2011) stated that DaibagnyaBalbhadra, in 1494 AD from Jumla, had made BalbothaniTika of this Bashawati book a textbook of Mathematics. Other many mathematicians had contributed to developing mathematics(Raikhola et al., 2020). It shows that Karnali province's indigenous mathematics had been explored in ancient times. In this regard, the original mathematics is existing(Sterenberg, 2013). The shepherds and farmers have used different counting systems. In the other countries are practices of their indigenous mathematical knowledge(Chahine, n.d.). In this study, the researcher focused on exploring the indigenous mathematics existence and practices in Karnali Province.

Objectives of the Study

The main objective of this paper was to explore the indigenous mathematics at Karnali Province, and specific objectives were as follows.

1. To explore the existing indigenous mathematics in Karnali province.
2. To find the practices of indigenous mathematics in school-level mathematics.

Research Questions

The research questions of this paper were follows as;

1. Does indigenous mathematics exist in Karnali province?
2. What are the practices of indigenous mathematics in school-level mathematics?

Method

The research focused on exploring indigenous mathematics existence and practices at Karnali Province. For this purpose, researchers have used qualitative research design. The data were analyzed based onthematically. The sample of this study was selected from the secondary level mathematics teacher who was participated in Teachers' professional training (TPD) of the Karnali province. The purposively selected ten teachers from 30 teachers for focus group discussion. The focus group discussion (FGD) was conducted based on participant's biographic information, existing indigenous mathematics, cultural mathematics, different occupations related to mathematical information, and use of indigenous mathematics in teaching mathematics classroom(Nkopodi & Mosimege, 2009). After collected information by using focus

group discussion, the researcher has developed different themes and analyzed them.

Data Analysis and Interpretation

Karnali's multi-ethnic lifestyle was a mixture of agriculture, animal husbandry, products, harvesting herbs, and wildlife and outbound migration during winter for work and trade (Bhattarai &Katawal, 2020). The participants of this study as;

Table 1

Teachers qualification and teaching experience

Teaching Experience in Year	Frequency
0 - 5 Years	3
10 - 20 years	2
5 - 10 Years	5
Total	10

Qualification	Frequency
Bachelor Degree	3
Master Degree	7
Total	10

The collected data was analyzed in the following subheadings:

Indigenous Mathematics Existence in Karnali

Karnali province is rich in culture, and it is the origin of the Nepali (Khas) language. The DaibagnyaBalbhadra was the first mathematics teacher and writer from Karnali(Basyal, 2020). The different indigenous mathematics exist in Karnali Province. In this regard, what are the counting system, methods to count numbers, time measurements, distance, weight, and volume of liquid? On the basis of FGD, the respondents said that;

> it was found that they used base 20 system as count 45 as Two Bisa and Five. Drawing the line on the wall, fingers, keeping stone, maize stone, match the different objects to count cow, sheep, goat, and another object for counting number. They answered that sowing position of sun, star, and moon, and showing sunlight shadow. The people of Karnali are using hands spans (Bitta, Hat, Angul), Foots, Mail, Kosh to measure the distance. They have answered as Dharni, Bisauli, Mana, Pathi, Muthi; Muri were used to measure the weight of objects. The mana, Kuruwa, and Pathi were used to measure the Oil, water for the measurement….

Cultural Mathematics in Karnali

In Karnali province, Deuda, Mayur dance, Paiseri dance, Khando dance are the main dances and songs. What mathematics exist in Deuda's song? One participant teacher said that *full circle, half-circle inequalities* exist; another teacher said that *rotation, angle circle* existed. The singers, in a circular way standing on the fields to sing a song of Deuda's song. The following first figure shows that circular image where half-circle males and half-circle

females. The second figure also presented a circle.

Source: Google

In the same way, different indigenous mathematics knowledge exists in theMayur dance. According to participant, in the Mayur dance there are 16 to 22 players in pair wise. They had played on the based on Madal with sticks. It refers to counting *one, two, to twenty-two says Yak Hata, Dui Hata, and Bais Hata*. These concepts were used to count, rotate, symmetric, addition, and subtraction. Thus the geometrical shapes as the circle and semicircle exist in the Deuda song which is useful to tech geometry as well as mensuration at school level mathematics.

Existing Mathematics in Different Occupations

Agriculture, animal husbandry, products, harvesting herbs, and wildlife are the main occupations in Karnali Province. The participant teacher of this study had explained the general ideas of different occupations. In agriculture, the first participant said, "Yes, in many uses of mathematics," and the second teacher said *mensuration*. Similarly, the fourth teacher said that "line, cylinder, combined solid is using to digging field by Hallo and Phalo. The fifth teacher had said that "types of line (straight line, curve line), rectangle, angle, the distance between seeds, etc. have existed in farming". Another teacher said that "Calculation of seeds, fertilizer, plotting, the ratio between the area of land seed". In animal husbandry, there were different mathematical knowledge exist. The counting system was developed from goat farming. In the summary of FGD, there had different indigenous mathematical knowledge exist as sheep and goat, set, symmetrical shape in knitting clothes, circle and transformation in making Oil by Kol, function in Kol (input mustard, processing and output Oil), object exchanges and profit and loss had existed in different occupations. From the above discussion, the researcher had concluded that the different mathematical ideas, knowledge, and indigenous mathematics have existed in different occupations.

Use of Indigenous Mathematics in Teaching Mathematics at the School Level

The researcher has raised three questions for the use of indigenous mathematics in classroom activities. The first question was, are you using indigenous mathematics in school-level mathematics teaching or not? If yes, please explain in brief. The answer from the site of participant teachers was summarized as Yes. We used different examples, material, knowledge, building construction, area of land, transformation, mensuration, profit and loss, and interest in teaching abstract mathematics concepts. The second question was how we could use indigenous mathematics in the curriculum? For the information of above questions, they said thatas in local mathematical contents included in the curriculum, develop the project works related to daily life activities, traditional measurement systems, units, and tools should be included in the curriculum, the base twenty system should be kept in the curriculum as a binary and quinary system. The third question was how to develop our indigenous mathematics? The participant teacher in FGD had said different answers. It was included that local and indigenous mathematical content in the curriculum, construct teaching activities related to daily life mathematical problems. Furthermore; It helps to policy maker and curriculum designer as well as local government to develop local curriculum and implementation them. It also uses familiar materials in teaching mathematical concepts; project work should be related to different cultures, occupational

mathematics for mathematics teachers and students at school level.

Conclusion

In Karnali province, there exist different indigenous mathematical knowledge in different field. The base twenty system, local counting styles, units, and measurement tools exist in different cultural practices and dances. These concepts should be used to count, rotate, symmetric, and addition and subtraction in mathematics teaching learning process at school level(Basyal, 2020). Similarly, the different occupations as agriculture, animal husbandry, knitting clothes have different mathematical concepts and indigenous mathematical knowledge which can be used to connect with classroom teaching. It is concluded that Indigenous mathematical knowledge should include in local curriculum and construct teaching activities related to daily life mathematical problems. Mainly teaching learning process of mathematics should be connected with different cultural practices and different indigenous mathematics knowledge. It is recommended that the policy maker and local government should be awareness about the different existence and practice of indigenous mathematical knowledge. Similarly, mathematics teachers should also be aware to use these ideas in the classroom teaching to make their teaching learning activities alive and lifelong.

Author's Biography:

Jassbir Roka is an Asst. Prof. of Mathematic Education in Mid-west University Nepal. Currently he is M.Phil. Scholar in Nepal Open University. He has published many papers in different reputed journals nationally and internationally. He is interested in research in Mathematics Education. Now he is secretary of Council for Mathematics Education, Karnali Province, Nepal.

Reference

Basyal, D. (2020). A mathematical poetry book from Nepal. *British Journal for the History of Mathematics*, *35*(3), 189–206. https://doi.org/10.1080/26375451.2020.177778.

Chahine, I. (n.d.). Mathematics teachers' explorations of indigenous mathematical knowledge systems through immersion in African Cultures. *Centroedumatematica.Com*. http://www.centroedumatematica.com/memorias-icemacyc/130-535-2-DR-C.pdf

Constituencies, R., & Constituencies, P. (n.d.). *Factsheet on women Nepal , Province 6 - Karnali*. 3–6.

Gesellschaft, G. (1974). *On the Geology of the Karnali and Dolpo Regions*.

Karnali, I. (2010). *Education practices in Karnali*.

Nkopodi, N., & Mosimege, M. (2009). Incorporating the indigenous game of Morabaraba in the learning of mathematics. *South African Journal of Education*, *29*(3), 377–392. https://doi.org/10.15700/saje.v29n3a273

Raikhola, S. S., Panthi, D., & Jha, K. (2020). *On contributions of Chandrakala Devi Dhananjaya to mathematics in Nepal*. *5*(4), 43–48.

Sterenberg, G. (2013). Considering Indigenous Knowledge and Mathematics Curriculum. *Canadian Journal of Science, Mathematics and Technology Education*, *13*(1), 18–32. https://doi.org/10.1080/14926156.2013.758325

The survey, H. (2016). *Karnali Province*.