

**BASIC MATHEMATICAL CONCEPTS PRACTICED BY DANUWAR  
COMMUNITY**

**A  
THESIS  
BY  
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**FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF MASTER OF EDUCATION**

**SUBMITTED  
TO  
DEPARTMENT OF MATHEMATICS EDUCATION  
CENTRAL DEPARTMENT OF EDUCATION  
UNIVERSITY CAMPUS  
TRIBHUVAN UNIVERSITY  
KATHMANDU, NEPAL**

**2017**



त्रिभुवन विश्वविद्यालय  
शिक्षा शास्त्र संकाय

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**LETTER OF CERTIFICATE**

This is to certify that Mr. Lok Bahadur Karki, a student of academic year 2070/071 with Campus Roll No: 728, Thesis number 1222, Exam Roll No: 280444 and T.U. registration number 9-2-637-42-2009 has completed this thesis under my supervision and guidance during the period prescribed by the rules and regulations of Tribhuvan University, Nepal. The thesis entitled on "**Basic Mathematical Concepts Practiced By Danuwar Community**" has been prepared based on the result of his investigation conducted during the prescribed period under the Department of Mathematics Education, Central Department of Education, University Campus, Tribhuvan University, Kirtipur, Kathmandu, Nepal. I recommend and forward that this thesis submitted for the evaluation to award the degree of Masters of Education.

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(Assoc. Prof. Laxmi Narayan Yadav)

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**LETTER OF APPROVAL**

This thesis entitled "**Basic Mathematical Concepts Practiced By Danuwar Community**" submitted by Mr. Lok Bahadur Karki in partial fulfillment of the requirement for the Master's Degree in Education has been approved.

**Viva Voce Committee**

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**RECOMMENDATION FOR ACCEPTANCE**

This is to certify that Mr. Lok Bahadur Karki has completed his M.Ed. thesis entitled **Basic Mathematical Concepts Practiced by Danuwar Community** under my supervision during the period prescribed the rules and regulations of Tribhuvan University, Kirtipur, Kathmandu, Nepal. I recommend and forward his thesis to the Department of Mathematics Education to evaluate in final viva-voce.

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## ACKNOWLEDGEMENT

My first obligation is to the Department of Mathematics Education T.U., Kirtipur for providing me an opportunity to do a thesis on the topic of "Basic Mathematical concepts Practiced by Danuwar Community". I would like to express my sincere thanks, gratitude and gratefulness to my supervisor as well as my teacher, Mrs. Sarala Luitel, from the Department of Mathematics Education, University Campus, Kirtipur, who encourage me do this research. and his continuous all sorts of basic ideas, instructions and invaluable scholarly guidance for carrying out this research work from the very beginning to the end and enabled me to present this thesis in this form.

I wish to express my deep sense gratitude to my teacher Mr. Abtar Subedi, Department of Mathematics Education, Central Department of Education, T.U. for his valuable suggestions, guidelines, encouragements and giving constructive suggestions during the completion of this thesis. My Sincere appreciation goes to Prof. Dr. Hari Prasad Upadhyay, Assoc. Prof. Laxmi Narayan Yadav, Head of Department of Mathematics and ICT Education, University Campus, Kirtipur, who provided me an opportunity to write this thesis by approving my proposal. Specially, thanks Rabilal Adhikari, Bhabilal Adhikari, Biltu Adhikari, Siltu Adhikari, Mangala kumar Danuwar, Seyawati Adhikari, Reshamwati Adhikari, Fekani Danuwar for their kind co-operation and providing opportunities for collection of data. I am also deeply indebted to the Professors, Readers, Lecturers, teachers and staffs of the Department of Mathematics Education for their valuable inputs.

.....

Lok Bahadur Karki

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## **ABSTRACT**

The study is entitled 'Basic Mathematical Concepts Practiced by Danuwar Community'. It is a fresh attempt made at searching Danuwar's mathematical knowledge, ideas and concepts with respect to their practical work basis. This study is carried on cultural, historical, pedagogical and mathematical perspective. It also links those processes with mathematics curriculum. The researcher adopted the qualitative research methods to unveil local ideas of mathematics to interpret Danuwar mathematical concepts. Eight informants were selected purposively in which three are women and five are men. For data collection, the researcher used in-depth interviews; non- participants' observation and photos of Danuwar goods used and made which are linked up with their society. All the possible information was recorded with the help of field notes and photos.

They used different nine Khaad Ekai, Dunai, Garang, Bitgara, Sabai, Dedha, Adhai, Dhur, Kattha and different measurement system and some geometrical concepts. The findings of the research can be used to promote ethno mathematics through which teaching and learning mathematics in formal education system also be supported.

## DEDICATION TO

I dedicate this to my father, **Mr. Yagya Bahadur Karki** and mother, **Mrs. Masali Kumari Karki**. He has been a force in my life and he continues to motivate and inspire me. He will always be my hero.



## DECLARATION

This dissertation contains no material, which has been accepted for the award of other degree in any institutions. To the best of knowledge and belief and belief this dissertation contains no material previously published by any authors except due acknowledgement has been made.

Date: .....

.....  
(Lok Bahadur Karki)

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## **ABBREVIATIONS**

- CERID : Research Center for Educational Innovation and Development
- UNESCO : United Nations Educational Scientific and Cultural Organization
- VDC : Village Development Committee
- T. U. : Tribhuvan University

## Chapter-I

### INTRODUCTION

#### Background of the Study

Mathematics is the subject that has significant impacts on people. Every people need mathematics to solve the problems in the daily activities. The development of mathematics was simultaneous with the social development. The development of mathematics has its far history with the development of human civilization. “Mathematics is used throughout the whole world as an essential tool in many fields, including natural science, engineering, medicine and the social science “(Bell 2008).

The concept of number and the process of counting developed, as so long before the time of recorded history, that the manner of this development is largely conjectural. It seems fair to argue that human even in the most primitive time, had some number sense, at least to the extent of recognizing more and less when some objects were added to or taken from a small group. With the gradual evolution of society, simple counting becomes imperative. A tribe has to know if his flock of sheep was decreasing in size. Probably the earliest way of keeping a count was by some simple tally method, employing the principle of one to one correspondence. In keeping a count on sheep, for example, one finger per sheep could be turned under. Counts could also be maintained by making collections of pebbles or sticks, by making scratches in the dirt or on a stone, by cutting notches in a piece of wood, or by tying knots in a string. Then perhaps later, an assortment of vocal sounds was developed as a word tally against the number of objects in a small group. And still later, with the refinement of writing, an assortment of symbols was devised to stand

for these numbers. Such an imagined development is supported by reports of anthropologists in their studies of present-day primitive people (Eves, 1981).

Ethno- Mathematics as the mathematical practiced among cultural groups such as national tribal society's labor groups; children of a certain as bracket, professional classes and so on. There in world, different castes, races do have different cultures. Their culture used own tradition as well as professional mathematics skills, concepts, knowledge etc. Also in our country several castes, races there are also different regions, Tarai, Hill, Himal etc. Their unique living style is using different mathematics to solve their daily life problems, mathematics can be learnt by every culture, race gender, castes, regions etc. But their own mathematics may be consisted them. Language is the highest influencing factor for learning mathematics.

Geographical differ pupils do have differences in race, ethnic, casts, cultures; and also they have differences in language. So their mathematics learning must be differences in other geographical pupils who have mother –tongue language (D'Amboise, 1985).

Ethno encompasses identifiable cultural groups as national tribal societies; labor group children of certain ages, professional classes etc. and included their Jargons, codes, symbols, myths and even specific ways of reasoning and inferably (UNESCO, 1998).

The developments of both number counting and math processes were based on simple interactions between people with regard to physical objects in their own environment. Number recording needs counters; fingers and toes are clearly the handiest of all counters therefore, a counting system based on fingers (10) and fingers and toes (10+10) were developed in many parts of the world. The invention of symbols helped to develop mathematical processes, which utilizes positional representation of numbers and operation of numbers. This made math process:

addition, subtraction, multiplication and division. Today people have developed several forms of number counting: some of base 2, sum of base 5, sum of base 10, sum of base 20 and so on. Some ancient counting systems have already become absolute and some others that have survived gradually being replaced by new system. For example, the Franc, "quainter vignette dig" means "four twenties and ten". The previous British momentary system of "20 shillings = 1 pound" was based on 20 (CERID, 1990).

According to Gloria Gilmer, Math-Tech Inc: Ethno-mathematics is the study of the mathematical practices of specific cultural groups in the course of dealing with their environmental problems and activities; for example, the manner in which professional basketball players estimate angles and distances differ greatly from the corresponding manner used by truck drivers. Both professional basketball players and truck drivers are identifiable cultural groups that use mathematics in their daily work. They have their own language and specific ways of obtaining these estimates and ethno-mathematicians study their techniques. The prefix 'ethno' refers to identifiable cultural groups, such as national-tribal societies, labor groups, children of a certain age bracket, professional classes, etc. and includes their ideologies, languages, daily practices, and their specific ways of reasoning and inferring. 'Mathema' here means to explain, understand and manage reality specifically by ciphering, counting, measuring, classifying, ordering, inferring and modeling patterns arising in the environment. The suffix 'tics' mean art or technique. Thus ethno-mathematics is the study of mathematical techniques used by identifiable cultural groups in understanding, explaining, and managing problems and activities arising in their own environment. In addition, mathematics is primarily an investigation into the origin of discoveries in mathematics and to lesser extent and investigation into the



mathematical methods and notation of the past. Before the modern age and worldwide spread of knowledge, written examples of new mathematical development have come to light only in few locales. The most ancient mathematical texts available are Plimpton 322 (Babylonian mathematics c. 1900 BC), the Rhind mathematical papyrus (Egyptian mathematics c. 2000-1800 BC) and the Moscow mathematical papyrus (Egyptian mathematics c 1890 BC). All of these texts concern the so-called Pythagorean Theorem which seems to be the most ancient and wide-spread mathematical development after basic arithmetic and geometry.

### **Introduction of Danuwar**

Nepal is small country. It is an encompassment of colorful ethnic groups and communities. It is a nation of village inhabited. By diverge of ethnic groups, speaking different language, with different faith and culture (Toni Hager, 1961). The Danuwar is one of the Indo-Aryan tribes of Nepal. They live in upper slope of the hills mainly in Sindhuli, Sindhupalchok, Kavre, Sindhuli, Lalitpur, Nuwakot, Makwanpur, Udayapur, Dhading and Chitwan district, also known as the upper Mahabharat range. Moreover, the population of Danuwars is in large numbers also in Sindhuli district. They are still living in a mainly Kamalakhonch. Their socio-economic condition is too poor and education and politics is far from their access.

Their occupation is agriculture but it is insufficient to sustain their life. However they are still dependent on the agriculture for additional food supply (Ribolli, 2000). These people have their own language, culture, and behavior patterns. They are god-fearing, honest and humble followed by superstition and ignorance. They belong to four clans-loincloth wearer, thread wearer, Rai and Adhikari. The loincloth wearing Danuwar live between the Chure and Mahabharat ranges while the thread wearing ones also known as Rajan Danuwar, live in the Terai plains, Rai

Danuwar Prefer the river Banks. They are divided into several subgroups or steps but as Dhoni, Chheku, Kuechariya, Rajan, Kushniya, Janai dhariya, Kunwar, Adhikari, Dhami, Rai, Kanchla, Nampurchre, and so on. They have their own Language, but it is slowly fading away. In religious matters Danuwar are much closer to the Tharu and Dhimal ethnic groups. They also engage in farming only 24.5% Danuwars are literate and 60 Percent of them live below poverty line. According to census 2011 their population is 84,115, this is 0.31% of total population. Out of it female are 44129 and male are 39986. Out of the total Danuwar population (84115), 7278 (9%) are in urban, and 76837 (91%) in rural areas. Among them, a total of 3659(4%) are in mountain, 38607 (45%) are residing in hills, and 41849 (51%) in Terai. The population distributed in the regions is as follows: 26951 (32%) in eastern region, 56957 (68%) in central region, 133 in western, 43 in mid-west, 41 far- west.

The Danuwar people of Sindhuli have their own traditional system of Numeration, measurement and geometrical objects. The counting and measurement system were locally developed in the past when there was no need of standard measurement units and no pressing needs of the use of numerals. These systems have practiced utility in their life. To teach and study under formal educational materials, the advance of geometry were certain increased of the government of Nepal is also trying to apply Danuwar education at primary level in mother languages but it is not practically implemented because of many problems. If this geometrical shape used by Danuwar caste in totally implemented from school level, then there was more chance to progress in these shapes. They learned these mathematics concept, counting and measurement system, geometrical objects or mode technique of their own instructions. So this study is a focus on mathematical concept of Danuwar community

of Sindhuli district. Dudhauri, Sindhuli is the area study of the research where there is the massive density of Danuwar found ever.

## **Sindhuli**

Sindhuli district, a part of province No.3, is one of seventy-five districts of Nepal, a landlocked country of South Asia. The district, with Sindhuli madhi as its headquarters and covers an area of 2,491sq.Kamala Khonch of Sindhuli district was known traditional Danuwar states or Danwar.

## **Statement of the Problems**

Nepal is a multi-cultural, multi-ethnic and multi-lingual country. Each and every caste has its own cultural heritage and way of living. Mathematics is now considered as social creation. Culture is the contributing factor for the development of mathematics. Mathematics plays a vital role in the development of culture and civilization and vice versa. Each and every culture has its own way of defining and understanding towards the things and phenomenon. So every culture has its own way of measuring, calculating and doing basic mathematical processes. Hence cultural diversity and the equity of learning opportunity have been considered as one of the problems in mathematics. So Ethno-mathematics has been emerged as one issue in mathematics. Danuwar is one of the marginalized castes. Their cultural activities are different from other cultures so studies have been conducted dealing with the concept relating to Ethno-mathematics of Danuwar community in Nepal. Therefore, the researcher intended to study the elementary mathematical concepts and process used by Danuwar. Hence this study is concerned with the following questions and the study intends to answer these questions specifically.

- How the Danuwar community has practiced counting system?
- In which ways measurement system is practiced in Danuwar community?

- How does a Danuwar community use the mathematical idea and geometrical concept in their daily life situation?

### **Objectives of the Study**

The main objectives of the study were as follows:

- To identify the counting system in Danuwar community.
- To find out the basic concepts and process of defining measurement system which are practiced by Danuwar community? (Weight, volume, area, length and distance).
- To explore the geometrical concepts are used for making domestic goods (Gedra, Chhapa, Dhakiya, Pathiya, and Deli)?

### **Significance of the Study**

This study is equally helpful for mathematics educator, mathematics teacher, mathematicians and other people who are interested in understanding the artifact of culture of Danuwar and its relations to basic mathematical concept. This study has both theoretical and practical values and this study could have a greater significance for development of curriculum of primary school. Therefore, this study will provide the basic information about the mathematical concept and process of Danuwar community. The significance of this study can be listed as follows:

- This study would add a new dimension in the field of Ethno-mathematics.
- This study would help to identify the counting and measurement system practiced in Danuwar Community.
- This study would help to make the content of mathematics in primary level, if primary education is given in the mother tongue.

- The result of this study would be helpful for policy maker, curriculum designer to consider Ethno-mathematics in curriculum.

### **Delimitation of the Study**

There are many ethnic groups in Nepal with their own culture, customs, lifestyle, dressing, tradition and mathematical system and the study can be done in many aspect of the community. The study was carried out about mathematical ideas and measurement in set of Danuwar community. The delimitations of the study were as follows.

- This study was limited to Danuwar community from Dudhauri municipality of Sindhuli district.
- This study is concerned to the mathematical concept, counting system, measurement system and geometrical concepts practiced by Danuwar community.
- It is limited to eight Danuwar people for responding from Dudhauri municipality of Sindhuli district.

### **Definition of Key Terms**

#### **Danuwar:**

Danuwar is one of the Highly Marginalized groups of indigenous ethnic group of Nepal whose homeland extends from the Eastern, western and southern part and as well as mostly in Tarai of Nepal.

#### **Mathematical concept:**

Mathematical concept refers to the abstract idea that is concept of counting, calculating and measuring etc.

**Measurement system:**

In this system it refers to the technique of measurement which includes:  
length/distance, area, volume and weight.

**Geometrical practice:**

In this study, geometrical practice refers to parallel lines, rectangle, rhombus, circle, congruence of concept which is practice by Danuwar community.

**Haat:**

It is the length measured by our hand taking length from the elbow to the tip of middle finger. It is called cubit in English, kuin in Newari, Hasta in Sankrit and haat in Nepali language.

**Ethno-mathematics:**

It is study of mathematics along with its inter-relationship to the culture.

**Ethnography:**

Ethnography is the in-depth study of naturally occurring behavior of individual their cultural context and it is derived from anthropology.

**Ethnic Group:**

It refers to a specific group of people having common culture, tradition and language. Danuwar lies in Ethnic group.

## Chapter-II

### REVIEW OF LITERATURES

The related study studies construct the platform for standing to the research and periphery of subject matter, which gives the theoretical support for the study. Different researchers were conducted to find the basic mathematical concept, knowledge and processes of Danuwar community was conducted. Therefore, the researcher is going to research on Basic Mathematical concepts and Process used by Danuwar Community in Sindhuli District. For the study of this topic, the related literatures are as follows:

#### **Empirical review**

**Wagle (2009)** had conducted study about “An ethnographic study in Tanahun District. To find out the mathematical concept and process those are embedded in the everyday working activities of the Magar community. This study emphasized to explore the technique, method and counting system used in this community, which were derived, own thin culture and activity. This study used three different group of Manpang VDC of Tanahun district as the population. The result showed that many conventional and traditional concepts are embedded in the practice of the Magar community. Mathematical concepts are used to count object, calculate domestic things and measuring land. This research also show that their acquired mathematical concepts through experience and practice activities, from their elder person of the community. This study concludes that Magar community has different counting system as comparing with Nepali system from one to ten. The basis fundamental operation practiced by Magar community as same as Nepali system. The used own their finger called "Amal" "Kurret and "Hatt" to find out the length of any shape and size. They used "Tulo" as weighting device.

**Gurung(2014)** has researched on titled, ” Mathematics in the Gurung community”. In where, she finds that Gurung community have their own mathematical practices such as counting number, number system, measuring system, addition, subtraction, multiplication, division and properties of rectangle. Those are possible to incorporate in the school mathematical curriculum. The empirical research in diverse community, the researchers find that there are several ethno-mathematical practices and able to incorporate in school mathematics curriculum.

**Chemjong (2013)** studied on “Basic mathematical concept practiced by Limbu community” and concluded that: the Limbu communities have their own script numbers of notation which were developed by the king Sirijanagha and rediscovered by the second Sirijangha which is called Kiranti script. The numeration system of Limbu community is based 10. Limbu script have also been identified as the natural cardinal numbers in which are hope= zero, lacha=aak .....fangshi=nau. They mostly prefer to construct geometrical objects which are triangles, spheres, circles, and rectangles and also used parallel axiom. They have concept of x-axis and y-axis.

**UNESCO (2008)** has done a study on “Developing Culturally Contextualized Mathematics Resource Materials: Capturing Local Practices of Tamang and Gopali Communities”. In this study it found that they have prepared five sets of curriculum resource materials for mathematics teaching and teaching as well encouraging parents to help their children for understanding of the mathematical concept from their household activities. In third position they have also prepared materials for geometry named as ‘Grand Tour of Geometry’ where they have explored the geometrical concepts dealing with various artifacts such as Doko (wicker basket), Ghum (locally prepared rain shield cover), structure of house and temple. Through this study, they



found that parents, teachers and students were very positive towards culturally responsive teaching learning and curriculum materials.

**CERID (1990)** conducted a research in title “Elementary process of learning mathematical concepts and process of Rasuwa Tamangs.” The purpose of that study was to identify the basic mathematical concepts used by Tamang adult with no formal mathematics education, to identify traditional Tamang method of mathematical operation and to find out the implication of Tamang process and tone up to the present learning situation. The project work has shown that the Tamang have their own system of measurement counting and their own mathematical processes and geometrical concepts. The study has also showed that the situation of children into the formal system. But it didn't study the effect of ethnic mathematics practices in the classroom.

**Rai (2011)** had study on mathematical concept and process practiced by Dumi Rai at Khotang District. Researcher select Jalapa VDC of Khotang district for the study area and only 25 respondents were taken for interview. For data collection methods interview, observation and related published and unpublished document were used. This research found that Dumi Rai people have two types of numeration system. They use own counting number in Dumi language as well as place value system they have mathematical process that is a simple commutative process. Addition and multiplication are done by grouping and addition process. Numbers are decomposed in different groups of the numbers for division. They have their own traditional system of measurement. Length is measured with hand fingers, and hand. Area of land is measured according to seeding and pouching time. Volume is measure by 'mutthi', 'mana', 'pathi' and 'muri'.

**Khanal (2008)** studied on “Ethnographic study on mathematical concepts and pressures by potter”. It is concluded that the going of knowledge is process of observing, reflection of thinking, performing, practicing and creation. To fulfill each and every mathematical needs potter applies mathematical concepts in their daily potter mathematics used by potter was unique characteristics. The conventional mathematical concepts were embedding in the work of the potter.

**Dhakal (2008)** has studied on “Basic mathematical concept and process of Raji Ethnic Group.” The purpose of the study was to study the counting system of Raji ethnic group, to find the way of the four basic mathematical operations practiced by Raji ethnic group. She conclude that the ethnic group have been basic 10 (younger/literate people) and base 20 (traditional people) practiced their community; they have not their own symbols for native names of numbers. Their own counting system, measurement system and operating system, now a day, literate and younger also use Hindu-Arabic counting system and they use short cut method to solve mathematical problems.

Thus, from the above literature review, a lot of studies were conducted around the field of ethno-mathematics. Among these practices, some were directly related to learning strategies of mathematical concept of different ethnic group. Nepal is one of the multi-cultural countries, where different ethnic groups are living and they have their own cultural system. These cultural groups perform their mathematical problems by their own style. The review of above literature researcher motivated to study the Basic Mathematical Concepts used by Danuwar Community. Therefore, on this ground, researcher motivated to carry out this study.

## **Theoretical construction**

This section deals with the theoretical supports of the study. There are many theories developed by different psychological and scientists related to child development and process of learning. Out of several learning theories, some are developed by cognitive, some are behaviorists, some are humanism and some are by constructivist. All theories has vital role in learning but this study is based on a society, so the researcher used Ethnography approach.

## **Ethnography**

Ethnography generally, refers to the scientific description of different races and cultures. It is a non-manipulative study of the cultural characteristics of a particular ethnic group. In another words, the researcher does not attempt to control of manipulative the phenomena under investigation, in an ethnographic study.

Ethnographic research is in depth study carried out in a natural setting. The different conceptions of truth, reality and evidence held by some language researchers is one reason for the growing attention being paid to the ethnographic techniques for gathering and analyzing language data.

The main purpose of conducting an ethnographic investigation is to discover the emit view of reality. Emit is the ethnography interpretation depending on one's view on the status of knowledge, the nature of truth and what one accepts as legitimate evidence. Emit is a cultural perspective of interpretation and categorization used by the number of the group under study to conceptualize and encode the knowledge to guide their own views. Ethnographic data is collected mostly by using the observation, interview or the both. The adaption of these qualitative data gathering procedure further helps to generate the hypothesis. That's why; the ethnographic investigation is a hypothetic-inductive study. To put it another way, the researcher

builds the hypothesis as that is suggested by the observation/interview using the inductive logic. Supporting observation as a widely used ethnographic technique, note that the strength of the ethnographic study lies in the observation of natural behavior in a real life setting, free from the constraints of more conventional research procedures. The assumption behind the natural study is that, human behavior is influenced by the setting in which it occurs. The most important behavior of individuals in groups is a dynamic process of complex interactions and consists of more than a set of facts, static's or even discrete incidents. The theoretical knowledge is interpreted on the bases of cultural explanation but in a natural setting, defining ethnography as a naturalistic inquiry, also points out that the research focuses on the cultural meanings revealed by the behavior of the subjects under study, within a context.

## **Chapter- III**

### **METHODS AND PROCEDURES**

This chapter deals with procedures carried out for the study. It provides a way to research about how to conduct the research. It helps the researcher to achieve the goal or objectives of the research. It describes the study design, selection of sample, data collection procedure, data analysis procedure etc.

#### **Design of the Study**

The design of this is ethnographic basis. Ethnography, sometimes known as cultural anthropology or more recently as naturalistic inquiry, is a method of field study observation. The nature of this study is qualitative and descriptive method was adopted for the analysis of data. The basic purpose of ethnographic research is to determine the physical and social environment in which the individuals under study live go to school and work. The roots for ethnography are in anthropology, which includes the study of cultural phenomena. In educational research, ethnography has been used to study the culture of schools and the people who inhabit them. A qualitative research focuses on understanding the social phenomenon and studies the case in their natural setting. The information and sources needed for the study were based on primary and secondary sources of data. Primary data was collect from field survey, face to face interview with respondents, observation and photographs. Similarly, secondary data was collected from different journals, books and related published documents.

#### **Population of the Study**

The population of the study was taken from the Danuwar peoples of Dudhali municipality, Sindhuli district. The researcher selected this municipality by purposive

sampling. The study area consist the majority of Danuwar population. The population of the study consisted illiterate adult member above 50 years, related member who was directly involves his/her traditional culture of the Danuwar community of research area.

### **Sample of the Study**

There are zero rules for sample for sample size in qualitative study. So sample size of this inquiry depends upon the researcher, what he wants to know? What is the purpose of the study? What can be credibility of the study and what can be done with available time and resources? Kumar (2006) mentioned that qualitative research as the issue of sampling has little significance as main aim of most qualitative inquiries is either to explore or describe the diversity in situation, phenomenon and issue.

For this content and topic researcher had taken eight people purposively from Dudhali municipality, Sindhuli district. These persons were chosen by purposive sampling. The selected person from different villages can give appropriate and actual information.

### **Tools for Data Collection**

There are different methods for collecting primary and secondary data. The researcher collected secondary data from different journals, articles, books and other published and unpublished documents. The tools were used for researches to get primary data were described below.

### **Observation**

Observation is a process in which one or more persons observe what is occurring in some situation. Observation concerns the recording of what is being observed. It is the most useful tool for data collection in any kind of research. The secret of good observation is to create the unusual form out of the common place.

Different persons have classified observation differently. Patton has classified observation on the basis of participation at two types: participant observation and Non participant observation. The researcher used Non participant observation method to collect the data. First the researcher met the people familiar with that study area. It was done so because the researcher was familiar with the culture of Danuwar. Researcher informed the senior person of that Danuwar community about the purpose of the study and visiting that village. The researcher took some information about the environment, culture and customs profession, economic condition of that community by the help of senior person. Researcher observed their life style, work, conversation, houses, land, customs and other interesting activities. Researcher noted the information on his notebook. The researcher observed their mathematical activities and noted also. The researcher spent 3 weeks for observation at Dudhauri municipality.

### **Interview**

There are many types of interview; the researcher applied interview guide line approach. The researcher prepared open interview guideline questions on the basis of daily life activities of Danuwar people and the suggestions from supervisor. The interview was taken individually with illiterate fifty years old Danuwar people because of culture are conserved by them. The interview guideline was changed on the basis of the interviewee's responses, local situations and observation. The researcher found the actual mathematical activities done by them in real life. The interviewee's were conducted in natural place and it was run according to interviewee. The information was noted in a note copy and used in the analysis and interpretation of the study.

## **Photographs**

Photographs are most important tools for every research. The researchers took some photographs about the cultural costumes of Danuwar community. They are especially engaged the traditional occupation fishing and agriculture.

## **Data Collection Procedures**

To get information about mathematical concept of Danuwar ethnic group, first of all the researcher visited the study area for collecting data. The researcher spent three weeks for observation at research area. Researcher met with social workers and said them about the purpose of visiting of the municipality. By the help of social workers, the researcher started to select the responds by using purposive sampling method. Researcher preferred to select illiterate fifty years old people because of culture is conserved by them. After then, the researcher took an interview according to the objective of interview guidelines, observes their daily activities, such as fishing, farming and laboring. The researcher collected data in note copy according to guidelines of observation.

## **Validity and Reliability of Tools**

The subject expert, specialist and supervisor were used to check the reliability of the tools. The tools were revalidated as necessary once with the help of supervisor and replaced the unnecessary notion. The researcher was observed the solid construction which helps to promote the validation of the study.

## **Data Analysis and Interpretation procedure**

After data collection using various means observation, interview, and photographs data organized in terms of their category. Then researcher analyzed these data using triangulation method; triangulation is a process of verification that increases validity by incorporating several viewpoints and methods. In the social



sciences, it refers to the combination of two or more theories, data sources, methods or investigators in one study of a single phenomenon to converge on a single construct, and can be employed in both quantitative and qualitative studies. Finally the researcher proceeded data analysis using thematic approach or rather on the basis of cross validation which is significant data analysis method of ethnography design.

In triangulation process, firstly the researcher used observation data and generated its theme secondly the researcher merged this theme with the essence of interview data. Finally these were analyzed based on photography.

## **Chapter IV**

### **ANALYSIS AND INTERPRETATION OF DATA**

This chapter is devoted to analyze and interpret the data from the field of observations, interviews and photographs. Mainly this chapter divided into three parts. First part describes the number concepts the Danuwar community. The second part includes the traditional ways of measurement of weight, measurement system, length/distance and its units. The third part includes the knowledge and practice of geometrical concept used in domestic goods. The main idea of the research is to study about the use of mathematic knowledge in traditional ways by Danuwar people without getting its formal education. In the present day to fulfill each and every need of human life, people need some mathematical concepts knowingly or unknowingly. “Mathematical concept used in Danuwar community” was a case study especially an exploratory case study which was conducted by using the ethnographic methodology. The data collected through the non-participant observation, interview and photograph is analyzed and interpreted were using different sub headings:

#### **Number concepts and counting system**

The concept of mathematics began with the concept of counting in the ancient period. The people at that time might have used to count their family members and cattle by different things using one to one correspondence method, number ideas and special language for their expression are important mathematical development. Mathematics is an important discipline to all human as they use it to solve their daily life problems. People in different community use mathematics differently. One of the most influencing factors to use mathematics is community where each person starts to learn. Most of the Danuwar people are illiterate in Dudhauri municipality. Some children go to school, but they do not complete school education due to family

problem and obliged to be the victim of child labor. Researcher found that the idea of counting system and numerals are explained while asking question to different Danuwar people. The Danuwar people mostly use their native counting system (which is in practice from long period of time). But the young children who are educated they used formal counting system. The researcher didn't find script of their own to record their number. The sample population who was above 50 years, met by researcher, engaged in cutting hen. The researcher asked how many hens have on your farm? He says "*Ekanabbe gorsiyo*". Majority of Danuwar people counted anything as below: Ekta, Duita, Tinta, Charta, Panchta, Chhata, Sathta, Athata, Nauta, Dasta upto sayata. According to sample person by pointing something, counts with Ego, Duigo, Tingo, Chargo, Paanchgo, Chhago, Satgo, Aathago, Naugo up to sayago. They explain counting their children Eksiyo, Duisiyo, Tinsiyo, Chariyo, Panchsiyo, Chhasiyo, Satsiyo, Aathsiyo, Nausiyo, Dassiyo up to sayasiyo.

Generally, older and uneducated Danuwar people used 20 based system of counting which is in practice from long period of time, but younger and educated people used to 10 based system or decimal also known as Hindu-Arabic system from the influence of education and interaction with other community.

Researcher asked question with 67 years old resident as sample how you count number? And his answer was Ego, Duigo....., Sayago, interesting one fact is that, he could count very fast opposite way 100,99,98,.....,2,1. He knows different nine Khaad. Khaad is counting system from one up to ten. He said different "Khaad" as: Ekai, Dunai, Garang, Bitgara, Sabai, Deda, Aadhai, Dhur, Kattha. Khaad system is one of the oldest forms of counting system familiar among Danuwar people, but only few people are found to be expert. Regarding this, sixty seven years old sample

person has shown his talent on Khaad with the confident. According to the research, following are the details received related to Khaad.

**Ekai:** Ekai is the counting system as: 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

**Dunai:** Dunai is the counting system as: 2, 4, 6, 8, 10, 12, 14, 16, 18, and 20.

**Garyang and Bitgara:**

Eghaar Garang	EkkaisaSaya	11×11	121
Eghaar Barang	BatisaSaya	11×12	132
Eghaar Terang	Tirchalisa Sasaya	11×13	143
Eghaar Chaudhang	Chaubanna Sasaya	11×14	154
Eghaar Pandhrang	PaisatthisaSaya	11×15	165
Eghaar Sorang	ChhayahattarSaya	11×16	176
Eghaar Satrang	SatasiSaya	11×17	187
Eghaar Atharang	AnthanabbeSaya	11×18	198
Eghaar Unnaisa	DuisayaNau	11×19	209
Eghaar Bisa	DuisayaBisha	11×20	220

And

Bar Eghara	BattisaSaya	12×11	132
Bar Barng	ChauwalisaSaya	12×12	144
Bar Tere	ChauwalisaSaya	12×13	156
Bar Chaudha	ArsathhiSaya	12×14	168
Bar Pandhra	AsisaSaya	12×15	180
Bar Sora	BiranabbeSaya	12×16	192
Bar Satra	Duisaya Char	12×17	204

Bar Athar	DuisayaSorha	12×18	216
Bar Unnais	DuisayaAtthais	12×19	228
Bar Bisa	Duisaya Challis	12×20	240

**Sabai:** sabai is a khad such as:  $1 \frac{1}{4}$

Ek Saba	Saba	$1 \times 1\frac{1}{4}$	$1\frac{1}{4}$
Dui Saba	Adhai	$2 \times 1\frac{1}{4}$	$2\frac{1}{2}$
Tin Saba	Paune Char	$3 \times 1\frac{1}{4}$	$3\frac{3}{4}$
Char Saba	Panch	$4 \times 1\frac{1}{4}$	5
Panch Saba	Saba Chha	$5 \times 1\frac{1}{4}$	$6\frac{1}{4}$
Chha Saba	Sade Saat	$6 \times 1\frac{1}{4}$	$7\frac{1}{2}$
Saat Saba	PauneNau	$7 \times 1\frac{1}{4}$	$9\frac{3}{4}$
Aaatha Saba	Das	$8 \times 1\frac{1}{4}$	10
Nau Saba	Saba Eghar	$9 \times 1\frac{1}{4}$	$11\frac{1}{4}$
Das Saba	Sandhe Bara	$10 \times 1\frac{1}{4}$	$12\frac{1}{2}$

**Dedhe:** mathematical notation of Dedhe is  $1\frac{1}{2}$ .

Ek Dedhe	Dedhe	$1 \times 1\frac{1}{2}$	$1\frac{1}{2}$
Dui Dedhe	Tin	$2 \times 1\frac{1}{2}$	3
Tin Dedhe	SadheChaar	$3 \times 1\frac{1}{2}$	$4\frac{1}{2}$
Char Dedhe	Chha	$4 \times 1\frac{1}{2}$	6
Panch Dedhe	SaadheSaat	$5 \times 1\frac{1}{2}$	$7\frac{1}{2}$
Chha Dedhe	Nau	$6 \times 1\frac{1}{2}$	9
Saat Dedhe	Saadhe Das	$7 \times 1\frac{1}{2}$	$10\frac{1}{2}$
Aaath Dedhe	Barha	$8 \times 1\frac{1}{2}$	12

Nau Dedhe	SaadheTerha	$9 \times 1\frac{1}{2}$	$13\frac{1}{2}$
Das Dedhe	Pandhra	$10 \times 1\frac{1}{2}$	15

**Adhai:** Mathematical notation of Adhai is  $2\frac{1}{2}$ .

Ek Adhai	Adhai	$1 \times 2\frac{1}{2}$	$2\frac{1}{2}$
Dui Adhai	Panch	$2 \times 2\frac{1}{2}$	5
Tin Adhai	SadheSaat	$3 \times 2\frac{1}{2}$	$7\frac{1}{2}$
Char Adhai	Das	$4 \times 2\frac{1}{2}$	10
Panch Adhai	SadheBarha	$5 \times 2\frac{1}{2}$	$12\frac{1}{2}$
Chha Adhai	Pandhra	$6 \times 2\frac{1}{2}$	15
Saat Adhai	SaadheSatra	$7 \times 2\frac{1}{2}$	$17\frac{1}{2}$
Aaath Adhai	Bis	$8 \times 2\frac{1}{2}$	20
Nau Adhai	SaadheBaais	$9 \times 2\frac{1}{2}$	$22\frac{1}{2}$
Das Adhai	Pachchis	$10 \times 2\frac{1}{2}$	25

The counting of money is different from other community. The counting system of money is base 20. Sample person used Rupiya chhad which is traditionally used in Danuwar people. Rupiya chhad is made by coin as suka, aathana(mohar), dui mohar. The money (Dhewa) counting is expressed in terms of paisa, suka, mohar and kori are as follows:

1paisa

25 paisa (Chaar Aana) =1 Suka

50 paisa (2 Suka) =1 Mohor(Aathana)

100 paisa (2 Mohor) = 1Rupees

20 Rupees=1 Kori, Danuwar community has their own identification to know the value of money (Dhewa). It is not seen to use in tendency as a common.

## Measurement system

### Weight measurement

In the research area, researcher found that weight measurement system was limited for trading of meat only but also nowadays they are not using their traditional measurement system. The Danuwar measurement weight system is much influenced by modern measurement system. The most important tools used in Danuwar community for measuring weight were Tulo. Sample person has a grocery but she didn't use Tulo. The researcher asked about Tulo that she said our father and grandfather used but present we use Taraju(balance). More detail, Tulo is made of iron bar (steak) and has fixed blob of mass on one side of that bar and other side carries a small nigalo or plate of thin iron, suspended by strings. The suspension could be shifted at different measure marks on due iron bar to balance the weight. The blob iron mass is working as a counter weight. Different measures marks in the iron bar called phulos. If there is not phulos at iron bar, they measure the weight using different measured sizes stones. The units of weight measurement are Paseri, Dharni, Phulo, Bisauli, sher, Aathpol, Hamali, Bodi. But young and educated Danuwar people are slowly changing their measurement units and have started to use modern measurement units: like Kilogram, gram, to measure the weight of any types of objects, when they have to borrow some goods from others places and cut meat of pig, Goat, and fish then use their measurement units. They used the following measurement system;

1 Dharni = 2 Bisauli

1 Bisauli = 2 Sher i.e. 1 Sher =  $\frac{1}{2}$  Bisauli

1 Sher = 2 Bodi i.e. 1 Bodi =  $\frac{1}{2}$  Sher

1 Bodi = 2 Athpol i.e. 1 Athpol =  $\frac{1}{2}$  Bodi

Hamali =  $\frac{1}{4}$  sher

Compare the above measurement system with global math,

1 Dharni = 2.5 kg, this shows

1 Bisauli = 1.25 kg (1 Bisauli > 1 kg). 1 kg 250 gram is the modern measurement of Bisauli.

Sher =  $\frac{1}{2}$  kg 125 gram

### **Volume Measurement**

In Danuwar community, measurement is mainly used to measure paddy, Daru, yoghurt etc. The volume of grain or water is usually required while having and asking for a family and for trading of cereal and liquid materials. Sample person said that units of volume measurement widely used are: chimti, muthi, pasar, mana, kuruwa, pathi, muri etc. The measurement of volume is used in daily life. Pots are such as Pathiya, Dhakiya, Dhaka, Gabali, Kothi, Bottle, Glass etc. They use muthi, mana, kuruwa, pathi, muri measure rice, paddy, corn, wheat, lentils etc. They measure of volume of liquid materials to measure by Gabali, Bottle, and Glass etc. They use Kuruwa, Dhawang pathi, different size can be seen in the following (fig.11) figure:

### **Conversion of volume**

10 chimti = 1 muthi

10 muthi (1 cope/anjuli) = 1 mana

8 mana = 1 pathi

20 Pathi = 1 muri

### **Measurement of Length and Distance**

Danuwar have their own measurement system in Dudhauri municipality. They still use their traditional measurement system. New generation use modern system of measurement tools to measure length and distance. But Danuwar people use their



traditional measurement system to measure the distance and length units are Auri, Kuret, Bitta and Haat. If they have to measure the very short length of anything they use fingers (auri).

Similarly, they use Kuret to measure which is distance between tip of the thumb to tip of the pointer figure and it is called Kuret which is presented in following figure:



**Figure No.1:1 Kuret**

They use Bitta to measure short distance which is distance between the tips of the thumb to the tip of middle finger which has shown in figure.



**Figure No.2: 1 Bitta**

Moreover, they measurement units is Haat and it is measured by the distance between elbows the tip of the thumb to the middle finger which has shown in figure.



**Figure No.3: 1 Haat**

**Length conversation**

11 auri= 1 Kuret

13 auri= 1 Bitta

2 Bitta = 1 Haat

2 Kuret 4 auri = 1 Haat

18 Inch = 1 Haat

1 Bitta = 9 inch

They use the units as lengths to measure the length and breadth of house, land, wood, trap, dhokso, kothi, chhapa etc. 64 years old Sample Person said to be time and distance, Elder Danuwar people only used to measure the long distance by Kosh.

Kosh is a man travelling distance at 1 hour and a man travelling one day approximately 10 Kosh. If we haven't watched, we use shadow to guess time. When the shadow is going to near the object they think time is closure to 12 o'clock and when sun is just above the man they also guess time is 12 o'clock (tang muni chhaya to 12 bajlo). sample person said the shadow increases 1 kuret then the time increases 1 hrs.

They divided 24 hours as Ek Din and Ek Raat. They divide different parts of day and night as follows:

4 am to 6 am=Bhinsara

6 am to 9 am=Bihana

Time between 10 am to 3 pm=Dinka (Barka din)

Time between 3 pm to 4 pm=Berikhum

6 pm to 8 pm=Sanjh

Time between 9 pm to 4 am=Raat (Barkiraat)

Also called,

Yesterday= Kalu

Today = Aaju

Bholi = Kalu

Parsi = Parsu

### **Area measurement**

Measurement of an area is mostly reflection in estimating farmland and building House, Goath and Khor, trap etc. also need to measure.

### **Area Estimation for House Plan**

Measurement of area is used by Danuwar people in their daily life to measure the area of their house, the simplest method used by the Danuwar for measurement of area one to one correspondences that has verification. When they start building house, they measure by a rope in which different symbols are marked on the basis of the length measure in haat which is used to measure required length of the ground.

Researcher asked question to House builder Sample person, how to make house? He said, if we want to build small house then we need 9 haat breadth and 13 haat length, if we build medium size of house then we need to need 9 haat breadths and 15haat length. The house 9-15 has 3 medium size rooms. They have used by haat to measure of medium size of rope. We have to draw on the right site by stretching-bending a

rope to the required shape of new house. The wooden pages nailed to the ground hole in equal distance the rope. Now days, the Danuwar people use start phitta, Ruler etc.

### **Measurement of land for Farming**

The farmland is usually measured in two ways: In terms of seed quantity required and In terms of ploughing. It is also measured in terms of grain yield. A mana is the unit of seed wise measurement of farmland. The bigger unit is the pathi. Both the mana and the pathi are the units of 8 mana=1 pathi. This unit is fairly accurate as all people sow seeds almost in the way and at the same space intervals. One mana of paddy seed is shown in a land area 5 dhur. According to Sample person, ploughing is done with the help of oxen directed by the ploughman, two oxen pull the plough. Sizes of the lands that could be ploughed in one day vary, the variation depending upon their structure. But it is customary for the farmers, to express the size of their land with a 'ploughing' day as the measurement unit. One 'Halo' is the area ploughed in one day at normal ploughing speed and moorland is approximately 2 kattha, where one day is calculate in Danuwar community time between 6 am to 12 noon. They use Biga, kattha, Dhur, Lagi to measure the land.

9 Haat=1 Lagi

1 Lagi×1 Lagi=1 Dhur

20 Dhur=1 kattha

20 kattha=1 Biga, If the land is square then length of 1 Dhur = 9 Haat or 1

Dhur = 4m and 10cm.

## **Geometrical knowledge used by Danuwar people**

### **Concept of Rectangle**

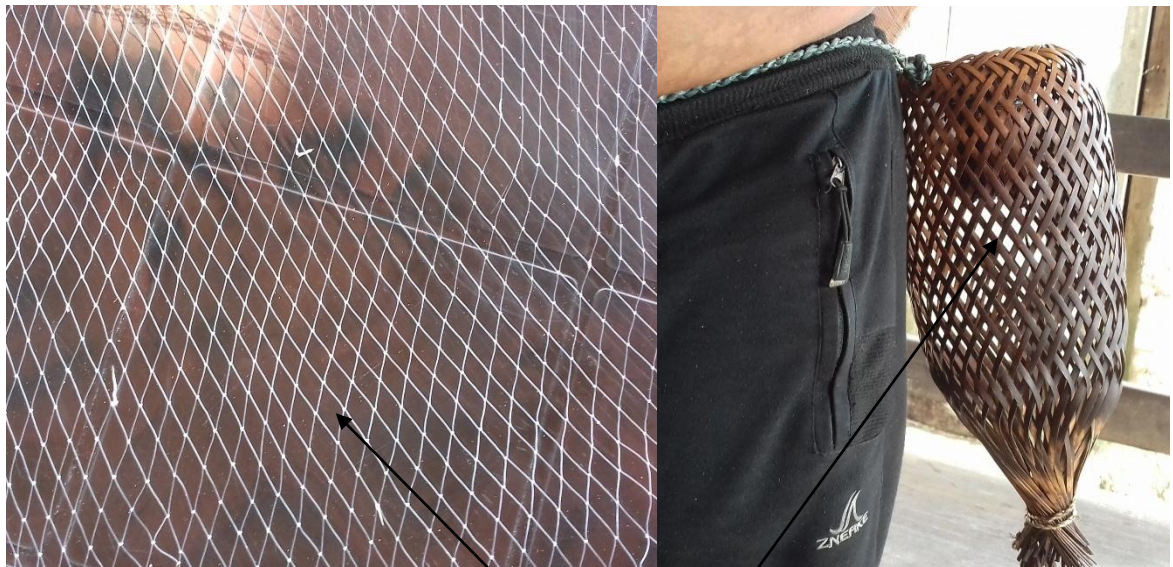
On day Sample person is ready to go fishing and carries the rectangular shape "Chhapa" made up of pujan. Chhapaha has four sides and opposite sides are equal. Researcher asked question "how to make chhapa for fishing?" they construct this object in such way that the pujan arrange horizontally after this tighten by rope from one side to another side. Similarly, tighten by pujan different places are till opposite side of the pujan. The rectangular shape of chhapa which has shown as figure:



**Figure No.4: Chhapa**

### **Concept of Rhombus**

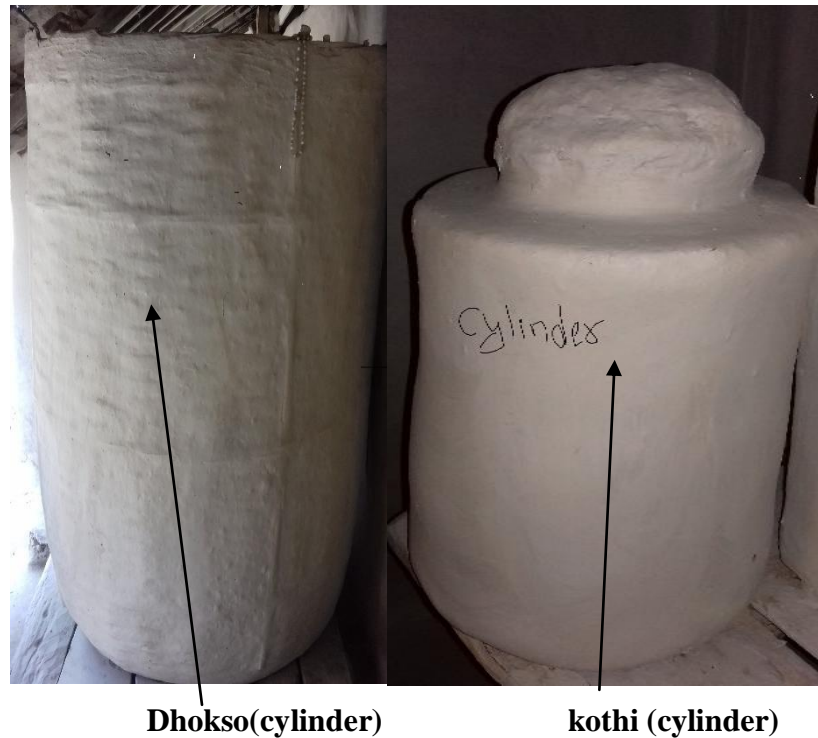
It was found that Danuwar community were using concept of rhombus in their Daily activity, to make Gedra, Jaal(trap) sample person whose occupation was related to fishing were used as a concept of rhombus. He had made the shape of rhombus in Jaal and Gedra. But, he didn't know the meaning of rhombus. Researcher found every drill (Bili/phani) of trap and Gedra in the shape of rhombus. The following figure shows the shape of rhombus:



**Figure No. 5: Shape of Rhombus**

### **Concept of Cylindrical shape**

It was founded that Danuwar community were using concept of cylinder in their Daily activity, to make Dhokso, sample person whose occupation was agriculture related to the concept of cylinder. He uses Dhokso for keeping paddy. But he didn't know the meaning of cylinder. Researcher asked, how do you make the Dhokso golo (Cylindrical)? His answer was personal practice teach him to make like cylinder. Following figure is concept of cylinder in Danuwar communities:



**Figure No. 6: Shape of cylinder**

### **Concept of Circle**

Researcher found that clear concept of circle was assumed in Danuwar community especially nest (khor) of pigeon (parewa) is the traditional. Researcher asked the question about circle with Sample person "Do you know about circle?" He replied as didn't know about circle but he used the concept of circle to make nest of pigeon. Again, researcher asked her how he learnt to make Golo (like circle). He learnt herself during the period of making bread, pirka, Nanglo by the help of senior. Nanglo is the other concept of circle in Danuwar community. He was making Nanglo by using the concept of diameter but he didn't know about diameter. Researcher asked him, how do you make the Nanglo as a golo? He showed different sizes of choya for making different sizes of Nanglo. The distance between every two group of choya was constant. They put the longest wicker on the center then they put short and shortest wicker respectively which helps them to make the Nanglo like circle.

Another concept of circle in Danuwar community is Mahajal. It is a trap for use fishing, maximum radius of mahajal 15 haat and minimum radius of trap is 4 haat. Sample person said if radius (length) is greater than 15 haat the tarp is not throwing in the river. He said if the length of trap is 15 haat then to spread 30 haat. It means Diameter ( $d$ ) =  $2 \times$  radius, i.e.  $d = 2r$ . Chutiya is the center point of trap (circle) for only condition of threw in the river. If length of trap is 5 haat then total cleat (goti) in circumference is 320 and distance between two goti is 4 phani where phani is the distance between two points of rope in circumference. It is found that Danuwar community is using the concept of circle with diameter but they didn't know the meaning of circle.



**Figure No. 7: Circle**

### **Concept of Parallel line**

Within observation period, use of parallel line occurred much more than concept but sample population couldn't answer the question about parallel lines. It means that they have no terminology to speak for parallel lines. Despite of this situation, they used the concept of parallel lines in their daily activity. Danuwar community were using concept of parallel lines in his field, in the make chhapa, make



Gedra and another places. Researcher asked them how they make parallel to rope in the Chhapa. They said the Pujana size must be similar then the ropes arrange the same distance with horizontally/vertically. After that the Pujana was knitting in the rope to make parallel lines they are using, Auri, Kuret, Bitta and Haat etc.



**Figure No. 8: Parallel lines (parallel rope in chhapa )**



### **Concept of Similarity**

Through the observation, researcher found that Danuwar community used the concept of similarity they called" Ustai" or same. This concept found when the sample population was using Dhwang pathi and Kuruwa. The kuruwa and pathi are in congruence shape. 8 kuruwa is equal to 1 pathi.



**Figure No. 9: (Dhwang Pathi and Kuruwa with Similarity)**

### **Concept of Congruence**

Through the observation and interview researcher found that Danuwar community have the concept of congruence but they haven't meaning of congruence. They can different congruent materials but they say it utrai utrai. This concept found when the sample population was making equal, Dhakiya, Deliya and Kuruwa. Researcher found Dhakiya and Pathiya is concept of congruence in Danuwar community.



**Figure No. 10: (Dhakiya and Pathiya with congruence shape)**

### **Chulo**

Chulo works are stove and used to cook the foods. Among them, some of them are in semicircle shape, circular shape, cylinder shape, rectangular shape are used for cooking pots like as Tasala, Batla, Karai which is used for cooking food, peeni which is used to make Chihar, Bread, Daru Chula which is used prepare food. There is a circular hole where cooking pot is kept. The fire woods are at the facial part is either exactly circular whole or rectangular shapes hoes to the oven. At the ancient period when stove, cylinder jar, heater etc. were not available for cooking purpose, it was used. The following figure is chulo of Danuwar community.



**Figure No. 11: Chulo**

### **Dhakiya**

In Danuwar community, it is used for keeping paddy, wheat, rice etc. it is also used for measurement. Its bottom or base part is in circular shape and its center like as loop design. It is made by dry straw, bamboo, dry grass. The round part of object is in spherical shape. For the preparation of Dhakiya they made a circular base first form circular point and gradually extended it slope upward in the circular shape which seemed bigger in the comparisons of bottom base. All part is full it seems to cone.



**Figure No.12: Dhakiya**

All above mentioned goods are prepared by Danuwar community for their various household purposes. It was found in the research that they made all those goods by a kind of juta plant and dry grass etc. Nowadays some people they use woolen and plastic by made a different type of Dhakiya, Pathia, Dela own size shape they made in Danuwar community.

### **Gedra**

Gedra is used for putting fish in like pencil shape. They constructed it form the split cave of bamboo. In Gedra, they use the concept of parallel line and rhombus.



**igure No. 13: Gedra**

### **Della**

Della is for putting fish has the circular base and it is in spherical shape at the upper part than part. They constructed it form the split cave of bamboo. For the construction of it firstly they made the base in circular shape at the bottom then they extended four bamboos sticks straight upward as required length which were main supports. After that, they began from the base part with Juta rope and small pieces of bamboo and extended it towards upward to give the shape. Finally, at the ending part, they made narrow opining with circular shape so that the fish could not go outside the object once they are kept.



**Figure No. 14: Dela/Deli**

All above mentioned goods are prepared by Danuwar community for their various household purposes. It was founded in the research that they made all those goods by a kind of juta plant and dry grass etc. Nowadays, some people use woolen and plastic by made a different type of Dhakiya, Pathiya and other things and traditionally skill are not shift in new generation. So, the traditional geometrical concept/skill will be abolished in Danuwar community.

## **Chapter v**

### **SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATION**

#### **Summary**

Generally, daily communication frequently involves and use of mathematical concept and logical reasoning to solve their daily problems in Danuwar community. It is existed in their environment context. Thus, the environment and culture determines to their mathematical ideas. This study was investigated on an ethnic group only in Danuwar community. This study was concerned with identifying the existence of mathematical, geometrical, numeration concept and mathematical process that used by Danuwar people in Dudhali municipality of Sindhuli district. This thesis result can help for policy maker, course designers and curriculum planner. The study's main purposes were to analyze the numeration system, to find out the geometrical concept used on making domestic goods as well as the measurement system practiced by Danuwar community.

The researcher conducted this study on the basis of ethnographic approach. Thus, it was descriptive in nature. Researcher had selected Dudhali municipality of Sindhuli district as the study area where Danuwar people have been living since many years ago so they have own their costumes, language and beliefs. Researcher collected the required information by note copy, observation, photographs of the study area and Danuwar's activities were on the suggestion of respondents, senior person and social worker. Researcher selected 8 persons of different age group to collect the information. Researcher asked and answered down and spent three week to collect the

information. The collected information were analyzed and interpreted in a descriptive way.

### **Findings of the Study**

The findings of the study are as follows;

- Base 10 and base 20 numeration system have been practiced in Danuwar community for counting purpose. Most older and uneducated Danuwar people use base 20 to count their age, money etc. and younger and educated people use base 10 numeration systems from the influence of education and interaction with other community.
- Younger and educated people also use Hindu-Arabic counting system and they can solve mathematical problems by direct and shortcut method also.
- The Danuwar communities have their own system of counting and measurement as well as their own mathematical process. All process is based on traditional practices. They use it through physical objectives in practical situations.
- Danuwar community has their geometrical knowledge. All these process were based on traditional practice.
- Counting number from one to nine (Ego/Ekta to Naugo/Nauta) has been identified the basic number in Danuwar community on the basis of hand's finger.
- The old Danuwar people of Sindhuli district had their own "khaad" counting system such as: Ekai, Dunai, Garang, Bitgara, Sabai, Dedha, Adhai, Dhur, Kattha.



- Tulo was main traditional material of weighting but nowadays, the educated/modern people use Taraju. Traditionally units were dharni, bisauli, sher, bodi, aathapol, hamali etc.
- The volume is measured with different types of pots. The units of volume are: chimti, mutthi, pasar, mana, kuruwa, pathi, and muri.
- In Danuwar community, lengths are measured with hand and fingers. The units of length are: Auri, Kuret, Bitta and Haat. They used kosh to measure long distance.
- Geometrical objects that they mostly prefer to construct such as: Dhakiya, Pathiya, Chhapa, Gedra etc. by the shape of various like conical, circular, circle, rectangle, rhombus etc. in Danuwar community.
- Perpendicular lines, parallel lines, similarity, congruence, plane etc. used in Danuwar community.

## **Conclusion**

The present study of Danuwar community has found their own system of counting, numeration system and geometrical concepts. The Danuwar people of Sindhuli have their own traditional systems of numeration, measurement and geometrical objects. They have own natives names for numbers 1-100 and 1000. There are suffixed (go/taa) to pronounce the count number in Danuwar language. But researcher could not find the Danuwar script. The counting and measurement system were locally, developed in the past when there was no need of standard measurement units and no pressing needs of the use of numerals. Danuwar community's measurement system and measurement units of distance are these systems have practiced utility in their life. To teach and study under formal education material, the advanced of the geometry will be certainly increased. They have used different

concepts for making the domestic tools such as a circle, a rectangle, rhombus, similarity, congruence; parallel lines etc. practically without knowing but fulfill their own needs. If this geometrical shape used by Danuwar caste is totally implemented from school level, then there will be more chance to progress in these shapes and also help to promote professional education in Danuwar community. They learned these mathematical concept, counting and measurement system, geometrical objects or mode technique of their own instructions.

Thus, there are many ways to link with the formal mathematics education. Thus, the government, curriculum planers, book authors and teachers should aware and emphasis on Danuwar community's mathematics which is unknowingly practiced in daily activities. Otherwise, gradually the traditionally mathematical counting and different skill will abolish in Danuwar community.

### **Education Implication**

This study conducted taking short period of time, small number of respondents and limited area. Therefore, the findings of this study may not cover all aspects of mathematics of Danuwar community. So considering these limitations, the following implications have been made:

- To find teaching materials available in the local community, which can get easily and students understand the concept meaningfully that makes teaching learning process effective and fruitful.
- School may be applied practical knowledge in socio-cultural activities which can promote their previous experiences.
- There is infinite mathematical (geometrical) knowledge in socio-cultural activities which can be used as curriculum resource and curriculum materials in the process of developing local mathematics curriculum of primary level.

- To explore the many culturally diverse ways in which mathematics education can be made more meaningful for and inclusive of the lives of students worldwide.

### **Recommendation for Further Study**

My experiences with the present research permit me to sound some recommendation and suggestion. Since this ethnography study was limited in certain aspects of finding of this study. So considering this limitation, the following recommendation has been made for further research.

- This study was done at small area of Dudhauri municipality so other researchers should be conducted in large area of Sindhuli and other district
- Further studies can be done on how the children of Danuwar community learn mathematical concepts in classroom and comparative study of Danuwar and Non-Danuwar students in mathematics.
- The mother tongue is heavily affected in learning Math's so; it should be used in teaching Danuwar native students.
- There are many ethnic groups in Nepal, having their own language, culture and tradition. Thus, the similarly researches could be conducted in other groups too.

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## APPENDIX-I

### Number counting in Danuwar language

English	Nepali	Danuwar
One	Ek	Ekgo
Two	Dui	Duigo
Three	Teen	Tingo
Four	Char	Chargo
Five	Panch	Panchgo
Six	Chha	Chhago
Seven	Saat	Saathgo
Eight	Aath	Athgo
Nine	Nau	Naugo
Ten	Das	Dasgo
Eleven	Eghara	Eghargo
Twelve	Barha	barhago
Thirteen	Terha	Terhago
Fourteen	Chaudha	Chaudhago
Fifteen	Pandra	Pandhargo
Sixteen	Sorha	sorhago
Seventeen	Satra	Satrargo
Eighteen	Athara	Athargo
Nineteen	Unnais	Unnaisgo
Twenty	Bis	Bisgo

Twenty One	Ekais	Ekaisgo
Twenty Two	Bais	Baisgo
Twenty Three	Teis	Teisgo
Twenty Four	Chaubis	Chaubis
Twenty Five	Pachis	Pachisgo
Twenty Six	Chhabis	chhabisgo
Twenty Seven	Sattais	sattaisgo
Twenty Eight	Athais	Athaisgo
Twenty Nine	Unantis	Unantisgo
Thirty	Tis	Tisgo
Thirty One	Ektis	Ektisgo
Thirty Two	Battis	Battisgo
Thirty Three	Tettis	Tettisgo
Thirty Four	Chauntis	Chauntisgo
Thirty Five	Paintis	Paintisgo
Thirty Six	Chhais	Chhaisgo
Thirty Seven	Saintis	Saintisgo
Thirty Eight	Athtis	Athtisgo
Thirty Nine	Unchalis	Unchalisgo
Forty	Chalis	Chalisgo
Forty One	Ekchalis	Ekchalisgo
Forty Two	Bayalis	Bayalisgo
Forty Three	Tirchalis	Tirchalisgo
Forty Four	Chauwalis	Chauwalisgo

Forty Five	Paintalis	Paintalis
Forty Six	Chhayalis	Chhayalisgo
Forty Seven	Satcalis	Satcalisgo
Forty Eight	Athcalis	Athcalisgo
Forty Nine	Unachas	Unachasgo
Fifty	Pachas	Pachasgo
Fifty One	Ekanunna	Ekanunnago
Fifty Two	Baunna	Baunnago
Fifty Three	Tripanna	Tripannago
Fifty Four	Chauvanna	Chauvannago
Fifty Five	Pachpanna	Pachpannago
Fifty Six	Chhapanna	Chhapannago
Fifty Seven	Santaunna	Santaunnago
Fifty Eight	Anthauunna	Anthauunnago
Fifty Nine	Unsathi	Unsathigo
Sixty	Sathi	Sathigo
Sixty One	Eksatthi	Eksatthigo
Sixty Two	Baisatthi	Baisatthigo
Sixty Three	Trisatthi	Trisatthigo
Sixty Four	Chausatthi	Chausatthigo
Sixty Five	Painsatthi	Painsatthigo
Sixty Six	Chhaisatthi	Chhaisatthigo
Sixty Seven	Satsatthi	Satsatthigo
Sixty Eight	Athsatthi	Athsatthigo
Sixty Nine	Unasattari	Unasattarigo



Seventy	Sattari	Sattarigo
Seventy One	Ekhattar	Ekhattago
Seventy Two	Bahattar	Bahattargo
Seventy Three	Trihattar	Trihattargo
Seventy Four	Chauhattar	Chauhattargo
Seventy Five	Pachattar	Pachattargo
Seventy Six	Chhahattar	Chhahattargo
Seventy Seven	Sathattar	Sathattargo
Seventy Eight	Athhattar	Athhattargo
Seventy Nine	Unasi	Unasigo
Eighty	Asi	Asigo
Eighty One	Eksi	Eksigo
Eighty Two	Bayasi	Bayasigo
Eighty Three	Tirasi	Tirasigo
Eighty Four	Chaurasi	Chaurasigo
Eighty Five	Pachasi	Pachasigo
Eighty Six	Chhayasi	Chhayasigo
Eighty Seven	Satasi	Satasigo
Eighty Eight	Athasi	Athasigo
Eighty Nine	Unannabbe	Unannabbego
Ninety	Nabbe	Nabbego
Ninety One	Ekanabbe	Ekanabbego
Ninety Two	Bayanabbe	Bayanabbego
Ninety Three	Triyanabbe	Triyanabbego

Ninety Four	Chauranabbe	Chauranabbego
Ninety Five	Panchanabbe	Panchanabbego
Ninety Six	Chhayanabbe	Chhayanabbego
Ninety Seven	Santanabbe	Santanabbego
Ninety Eight	Anthanabbe	Anthanabbego
Ninety Nine	Unansaya	Unansayago
Hundred	Saya	Sayago

## **APPENDIX-II**

### **Interview Guidelines**

#### **Mathematical concepts**

- a. How do learn mathematical concepts in your community?
- b. How do you know counting system of your community?
- c. How do you know measurement system of your community?
- d. Can you write the numerals in your own script?
- e. Which language do you feel easy to count?
- f. How do you measure daily time in your community?

#### **Counting system**

- a. How many members are there in your family?
- b. How many numbers can you count in your own language?
- c. Can you say the ten thousand, fifty thousand and one lakh in your own language?
- d. How do you count money?

#### **Measurement system**

Length/ Distance measurement

Area measurement

Volume measurement

Wight measurement

#### **Geometrical concepts**

- (a) Do you use mathematics method on your model techniques of instrument?
- (b) How do you make your Dhakiya?
- (c) Have you taken any training to make instrument?

## **APPENDIX-III**

**Photos**



**Fekani Danuwar**

**Dela**

**Dalla**

**Dhaka**



**Biduwa**



**Jaanto**



**Chekaa**



**Danuwar's house**