MATHEMATICAL PRACTICES IN MAITHILI COMMUNITY: AN ETHNOGRAPHY STUDY

A

THESIS

BY

MUKUNDAR MAHATO

FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF EDUCATION

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त्रिभुवन विश्वविद्यालय
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गणित शिक्षा विभाग

विश्वविद्यालय क्याम्पस
किर्तिपुर, काठमाडौ, नेपाल

UNIVERSITY CAMPUS
Kirtipur, Kathmandu, Nepal

TRIBHUVAN UNIVERSITY
CENTRAL DEPARTMENT OF EDUCATION
DEPARTMENT OF MATHEMATICS EDUCATION

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LETTER OF CERTIFICATE

This is to certify that **Mr. Mukundar Mahato**, students of semester system **2074/075** with campus Roll. no: **42**, exam Roll No: **7428288** and T.U. Registration no: **9-2-379-17-2014** has completed his thesis under supervision of **Prof. Dr. Bed Raj Acharya** during the period prescribed by the rules and regulations of Tribhuvan University, Nepal. The thesis entitled **Mathematical Practices in Maithili Community: An Ethnography Study** has been prepared based on the results of his investigation conducted during the period of September 2021 under the Department of Mathematics Education, University campus, Tribhuvan University, Kirtipur, Kathmandu. His thesis number is **1590**. I recommend and forward his thesis be submitted for the evaluation for awarding the Degree of Master of Education.

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Prof. Dr. Bed Raj Acharya

(Head of the Department of Mathematics Education)

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Date.

LETTER OF APPROVAL

This thesis submitted by **Mr. Mukundar Mahato** entitled on **Mathematical Practices in Maithili Community: An Ethnography Study** has been approved for the partial fulfillment for the requirement of Master's Degree in Mathematics Education.

Committee for the Viva-Voce	**Signature**
Prof. Dr. Bed Raj Acharya (Chairman)	……
…… (External)	……..
…….. (Member)	……

Date: ……

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विश्वविद्यालय क्याम्पस
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RECOMMENDATION FOR ACCEPTANCE

This is to certify that **Mr. Mukundar Mahato**, has completed his M. Ed. thesis entitled **Mathematical Practices in Maithili Community: An Ethnography Study** under my supervision during the period prescribed by the rules and regulation of Tribhuwan University, Kirtipur, Kathmandu Nepal. The study embodied the result of investigation conducting during the period of 2020 to 2021 under the Department of Mathematics Education, University Campus, Tribhuwan University, Kirtipur, Kathmandu. I recommend and forward his thesis to the Department of Mathematics Education to organize final viva-voce.

Date…….

……

Prof. Dr. Bed Raj Acharya

(Supervisor)

Defensed Date: ……..

DEDICATION

Honestly dedicated

To

My parents

Rajan Mahato and Tetri Devi

And

My brother Laxmi Kumar Mahato.

DECLARATION

This research contains no material which has been accepted for the award of other degree in any institutions. I declared that this thesis contains no material previously published by any authors except due acknowledgement has been made.

September 2021 ……..

Mukundar Mahato

(Degree Candidate)

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……..

(**Mukundar Mahato)**

ABSTRACT

This is an ethnography study on the entitled **"Mathematical Practices in Maithili Community: An Ethnography Study"**. The main objectives of this study were: to find out the mathematical practices in Maithili community, and to explore the pedagogical implication of mathematics practices in Maithili community.

The design of this study was qualitative with ethnography approach. I selected my own area Lalbandi Municipalty at Sarlahi District for research field. I used purposive sampling to select the sample 8 Maithili people were sample of this study. I used observation, interview, and photographs as my data collection tools and tried to cover the real practices of Maithili people to sort out mathematical practices.

From analysis and interpretation of data, I found various mathematical practices in Maithili community. Maithili peoples have huge of daily used materials that contained different mathematical concepts. They have farming materials (Tayer, Chhitte,Birba, Har, Palo etc.) in different shapes and sizes, different storage materials (Daliya, Berhi, Bhauki, Mujela, Ghumoua, Mathani etc.**)** by which the concept of mathematical knowledge can be find out, but due to the time and other constraints, I tried to see how these practices can be applied in teaching learning at the secondary level and in a formal education. It also see how can we relate those practice (Cultural Artifacts, Basketry works, Dung works, Measuring works, Wooden and Bamboo works) in elementary school mathematics and how can we use (Tessellation, Triangle, Cone, Dual Cone, Curve, Curve Pattern, Spiral Curve, Circle, Concentric Circle, Radius, Point, Arcs, Sectors, Volume, Parallel Lines, Perpendicular, Rectangle, Cylindrical, Ratio and Proportion etc.) those mathematical practices and students to relate mathematics with culture, and pedagogical process to include in the main stream of education for school program.

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Chapter I

INTRODUCTION

This chapter presents the background of the study, statement of the problem, the objective of the study, rationale of the study, delimitation of the study and definition of related terminology.

Background of the Study

Generally, research is the process of investigation into a specific area of inquiry. A research is defined as careful consideration of study regarding a particular concern or problem using scientific methods. According to the American sociologist Earl Robert Babbie (1938), "research is a systematic inquiry to describe, explain, predict, and control the observed phenomenon. I was began to mature, and I began to associate mathematics connect with my daily life. And I was motivated to solve the problems that came up in my daily life through mathematics.

History shows that human civilization was developed mainly in the Nile valley, Africa, Tigris and Euphrates, western Asia, Indus and Ganges South Central Asia, Hwang Ho and Yangtz-Estern Asia. We see all the civilization were oriented in the bank of great rivers where there was possibility of agriculture, river, furnished transportation and irrigation. So the early mathematician can be said to have originated as particle science to assist in agriculture and engineering pursuits (Eves, 1983). Eves (1983) further asserts that; harvesting storing opportunity of food, the creation of surveying methods of canal and reservoir construction, parceling land, evolution of financial and commercial practices for racing and collecting taxes for trade remained the facts of human civilization. Similar pattern can be observed in case of Maithili of Nepal for their habitation in the plain of Tarai and most of the habitation is abundance of agriculture.

Mathematics is one of the most crucial subjects for students. Mathematical knowledge is an essential part of our life. It is almost everywhere such as engineering, science, technology and etc. Scientist and engineers cannot do anything without the use of mathematics. According to the famous mathematician Gauss (1777-1855) "Mathematics is the queen of all science and the theory of number is the queen of the mathematics". And also

“Mathematics knows no races or geographic boundaries; for mathematics, the cultural world is one country” by David Hilbert (1862-1943).The above mentioned depicts the life I spent in mathematics, my attitude towards mathematics, my thinking towards mathematics. There is a famous quote by Shakuntala Devi that "Without mathematics, there’s nothing you can do. Everything around you is mathematics. Everything around you is numbers". In fact, mathematics is very important in our daily lives. For example, it helps to solve the problems in our domestic life such as profit, loss, bill payment, area, rectangle, percentage, interest, etc.

In a contemporary society, mathematics is related to the intervention of science and technology along with socio-political situation of the study. The word mathematics has been derived from the ancient Greek word “Manthancian” which means teaching to learn where as in Nepali; it is called “Ganit” which means “The Science of Calculation”. And in Sanskrit; the word of mathematics means “Like the crowning crest of a peacock and the shining gem in the cobra’s hood, mathematics is the supreme Vedanga Shastra. Nowadays it is defined as the science of numbers, quantity and space of which arithmetic, algebra, trigonometry, geometry etc. are the branches of mathematics. Mathematics is one of the essential subjects in school education. It is not only essential in school but it also used in official works as well as our daily life such as; selling, purchasing, arranging party, joining profession etc. mathematics consideration are uppermost in a human mind. Mathematics concepts are applied in history, political science, geography, economics, commerce etc. in our daily life. It is created to fulfill the daily need of human life thus, the nature and structure of mathematics was built with the development of human civilization. Roman, Greek, Arabian and Hindu and the all civilization great mathematician like Pythagoras, Euclid, Plato, Archimedes, Ptolemy, Pappus, Newton and Gavos contributed for the development of mathematics as likewise the ancient civilization like Babylonian, Egyptian etc. contributed for its development.

It is already mentioned that mathematics education is necessary to every field and every persons. So mathematics fest that is must to make popular or accessible to all. To make mathematics popular different mathematical programs were developed such as family mathematics program, ethno mathematics, women mathematics etc. Many mathematical organizations such as IMO, IMU, ICMI, ICME etc. played vital role to make mathematics popular. Among them ICMI IV put the most excepted slogans "Mathematics" for all and "Everyday life mathematics". So, we can say that mathematics education is necessary to all human or other in their daily life.

D'Ambrosio (1985) defined, "Ethno-mathematics as the mathematical practiced among cultural groups such as national tribal societies, labour groups, children of a certain age bracket, professional classes and so on. There are different cultures, castes, races. Professional mathematics skill, concept, knowledge etc. used in their cultures. In our culture it was made different not only castes, races, there are also different region, Terai, Hill, Himal etc. their uniqueness living styles are 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 of mathematics. Learning is geographical different pupils. Not only geographical differ pupils have difference in race, ethnic, caste; also they have difference in other geographical pupils who have mother tongue language.

Nepal is a Federal Democratic Republic country situated on the southern lap of the great Himalayas having diverse culture, religion, rich geography, tradition, art and civilization which recognized Nepal as a prosperous country in the cultural heritage of the world. Nepal is multilingual, multiethnic country with huge diversity and its unique identify. There are many castes and ethnic groups like Brahmin, Chhetri, Newar, Maithili, Mahato, Yadav, Teli, Magar, Rai, Limbu, Shah, Rajat, Gurung, Musahar, Chamar, Raut etc. According to the national census 2068, 123 languages and 125 caste/community lives in Nepal.

Maithili is a new Indo-Aryan (NIA) language written in the Devanagari script. It is spoken by a total of about 21 million people in the eastern and northern regions of the Bihar state of north India and the Southeastern plains, known as the Tarai, of Nepal. In the past, Maithili was regarded either as a dialect of Bengali (Beames 1872-79/reprint 1966: 84-85). Demographically, Maithili is the second most widely spoken language of Nepal and according to population census 2011, the total population of the Maithili in Nepal is 3.1 million. In the past, Maithili was written in the 'Mathilaksar' script, which is akin to the Bengali writing system. No definite date can be determined as to when Maithili began to be written in the Devanagri script. This is an extrapolation, based on the fact that Beames treats Vidyapati (1300-1448)- the greatest Maithili poet- as a Bengali Poet (Wikipedia).

Maithili community specially found in the Tarai area along the Saptari, Dhanusha, Sirha, Mahottari, Sarlahi, Routahat, Parsa and Bara districts . Indigenous knowledge is also known as folk knowledge or traditional science. The use of daily activities in teaching and learning for student makes learning of mathematics more meaningful and fruitful. In this essence, mathematics learning can be associated with one of the cultural events. For example if the majority of student are Maithili, the teacher should teach the values of Maithili culture regarding mathematics learning in order they do not forget their identity. Mathematics is a process of learning, which represent the backbone of human mind concerned chiefly with the ideas process and reasoning. Mathematics is becoming more and invisible in everyday life due to the high development of technology trends to hide the mathematics. Indigenous knowledge helps us as the basis for problem solving strategies for local communities. Therefore the native knowledge of Maithili community should be documented.

Statement of the Problem

This is an ethnography study on the entitled **"**Mathematical Practices in Maithili Community: An Ethnography Study**"**. The main objectives of this study were: to find out the mathematical practices in Maithili community, and to explore the pedagogical implication of mathematics practices in Maithili community.

Nepal is a multi-cultural, multi-lingual country. There are many ethnic groups in Nepal and every group has its own religions, social, professional and culture belief. Mathematics is an essential component of school and higher education. The need of mathematics is apparent for everyday life as well as for higher studies in the field of science and technology. In the context of Maithili community there are many document find out but in case of mathematics there is no more document related of mathematics practice in Maithili community. Some experts say that the lower participation of Maithili in mathematics education is due to the cultural as well as economic reasons.

I intend to find out the Mathematical practices in Maithili community. So this study tried to answer the question: How do Maithili people make geometrical figures for using their life and pedagogical implications? How many types of geometrical concepts are being used by Maithili community in their traditional equipment?

Therefore, this study was focused on the ethno-mathematics in Maithili community. I am also member of Maithili community, thus such questions occurred to my mind, so I was motivated to carry out this research in this area.

Objective of the Study

The main objective of this study was to find out mathematical practices in Maithili community: To reach this focus mission the following specific objective were considered;

- To find out the mathematical practices in Maithili community.
- To explore the pedagogical implication of mathematical practices in Maithili community.

Research Questions

Research questions were the initial steps of this study. It helped to collect accurate data without diverting out of track of this study. So the following questions were the basis of this research to rich the conclusion of this study;

- How do Maithili community people practice mathematics in their Cultural artifacts?
- How can Maithili community practices be linked with teaching- learning Mathematics?

Justification of the Study

Generally, every ethnic group has its own script and counting system which helps them for their prosperity for the further development. The ethno- mathematics is one of the important aspects of every ethnic group. This study reflects on the indigenous knowledge of Maithili community related to mathematics which may be helpful to teacher, researcher, student, policy maker, curriculum developers. This study gives a new geometrical dimension in ethno-mathematics practical in Maithili community. This study plays a vital role to seek the mathematical concept and practicing in Maithili community at Sarlahi district.

- This study would help to promote ethno-mathematical knowledge.
- It would help to motivate for encourage to the Maithili student to the study of the mathematical concept and practicing in Maithili student.
- It would help to dig out from beneath of Maithili community mathematical concept and practicing.
- It would remain as a basic to other research and investigation.
- It helps to the policy maker and curriculum planners to develop the culturally relevant and behavioral mathematics curriculum and text book.

Delimitation of the Study

Each study is not rigorous, perfect and free from limitation. They have some sort of limitation and on their hand they cannot overcome the problems of every field. This study delimited under the following aspects;

- This study was delimited to Lalbandi Municipality at Sarlahi district.
- This study was delimited for Maithili community.
- 8 Maithili's people were selected from 4 villages of Lalbandi Municipality, Sarlahi.
- This study was concerned only the mathematical concept, their pedagogical implication and geometrical knowledge practiced by Maithili people in their tradition equipment.

Definition of Key Terms

The words which are frequently used in this research are known as key terms. The definition of key terms would make this dissertation more understandable. Definition of these terms may be different than dictionary meaning. But the following definitions are only for understanding this research.

Indigenous knowledge. In this research indigenous knowledge refers to the unique cultural practices, intellectual resources, beliefs and values of a particular marginalize Maithili community.

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

Maithili. In this research, Maithili community refers to the name of minority indigenous community listed by the government of Nepal.

Mathematical concept. In this research mathematical concept refers to the concept of Maithili community on some basic mathematical aspects like teaching mathematics as well their pedagogical implication of square, cone, rectangle, circle, cylinder, parallel lines etc.

Pedagogical implication. Pedagogical implication has been used to indicate the geometrical teaching materials for teaching mathematics practicing by Maithili community.

Geometrical knowledge. The work of making mathematical description of wood, wool, thread, mud pots, bamboo of making system or process that can be used to explain. Above the instrument is different shape of geometrical figure show.

Chapter II

REVIEW OF RELATED LITERATURE

Literature review enables a researcher to become a specialist in the specific area. Like, laying a brick for building, literature review enables to continue the tradition cohesively and to integrate past work. It clarified the conceptual issues of my research area and helped me to learn about research design for the research. This literature review gave me insight to contribute something new in my research area. Many reviewed highlighted the benefits of culturally relevant education for supporting student learning. Mathematics is the cultural aspects of society. In this section, I reviewed some documents related to my study. Mathematics is a subject originated from our daily activities. "Mathematics is identified in cultural activities in traditional and non-traditional societies" (Orey & Rosa, 2007). This means that ethno-mathematics refers to mathematical concepts embedded in cultural practices and recognizes that all cultures and all people develop unique methods and sophisticated explications to understand and to transform their own realities.

This chapter presents the literature relevant to my study. In order to review from this literature I got ideas and guidelines for this research. I reviewed the literature by categorizing empirical literature, theoretical literature and conceptual framework.

Empirical Literature

Generally, empirical literature is reported in such a manner that other investigators understand precisely what was done and what was found in a particular research study to the extent that they could replicate the study to determine whether the findings are reproduced when repeated.

This chapter consists of a related article, journals, report, and previous thesis. I have reviewed some literature related to my research topics "Mathematical practices in Maithili community: An ethnography study". The literatures reviewed are as follows.

Yadav (1981) has done a research on the topic "Maithili Language and Linguistics". The main purpose of this research was to explore and document the existing indigenous knowledge about Maithili community. In the study, Maithili language, linguistics and the cultural knowledge how to effect on the Maithili related area to explore different indigenous

knowledge, skill and practice. The study concluded that culturally language helps for on teaching learning of Maithili student's own his different area.

D' Ambrasio (1984-1985) father of the ethno mathematics has used the expression "ethno-mathematics" refers to the form of mathematics that was a consequences of having embedded. In cultural activities whose purpose in other than "doing mathematics" on everyday activities such as building house, exchanging money weighting product, valuation and precise geometrical pattern. These applications of mathematics often look different from those used in school today.

Bishop (1988) "Mathematics is a pan-human phenomena and all human cultures might have own mathematics". The trend towards ethno-mathematical approaches to mathematics curriculum and pedagogy reflects a comprehensive development in mathematics education. Ethno-mathematics approaches are intended to make school mathematics more relevant and meaningful to student and to promote the overall quality of education. Furthermore, he suggested that people across the world and throughout time have used mathematics to measure, design, locate, explain and play (Bishop, 1988). These five universal actions can be used to investigate the math in what people do, how they live, what they build, and where they live.

Pandey (2008) conducted a research on "Cause of Low achievement in mathematics". A case study with the object to find out the causes of low achievement and to identify the strategies taken by school in improving mathematics and to find the ways of promoting mathematics achievement . He selected 6 student including 3/3 boys and girls according to different family background and the performance of the examination in mathematics. He analyzed the interview schedule takes by head teacher, mathematics teacher, selected student as well as their parents and class observation note in the basis of the theoretical framework of the effect of factor in mathematics achievement. His study concluded that there is discontinuously between home culture and school culture. The home environment is not supportive for mathematics learning.

Chaudhary (2017), I also reviewed a study of Chaudhary (2017) work entitled, "Mathematics practice in Tharu community" and conducted that before constricting any object at first they make a shape and size of that object in their mind and construct an object using traditional method of measuring using according to their thoughts designed before. They would not distinct between geometrical object having different shapes, for some machinery equipment. They could be able to tell the name of each art but some machinery equipment. They could say the name of whole object.

Research Gap,

I explore the mathematics practices in Maithili community and try to explain how we can relate those cultural practices with mathematics pedagogy. So I have try to explore the mathematical linked with mathematics pedagogy, teaching and learning in my own way because any related research doesn't try to explore the mathematical practicing in pedagogy. How can we make students as the multidimensional thinker rather than linear thinker? I argue that culturally relevant mathematics teaching builds the meaningful bridge between student's home culture and school mathematics. How can we empowered and encourage student to seek mathematics in their everyday life?

Theoretical Literature

The theoretical literature review help establish what theories already exist, the relationships between them, to what degree the existing theories have been investigated, and to develop new hypotheses to be tested. That means teaching and learning approaches developed on the basis of student learning model and theories insists on considering various aspects of teaching and learning. Especially in the context of teaching and learning of mathematics, there are various approaches propounded by L. Vygotsky, Ausubel, Bell, Brunner, Dynes, Guilford, Gagne, Piaget, Skinner. Here the researcher discuss about constructivism and cognitivist (social) in brief.

Ethno-mathematics

Ethno- mathematics is to seek to understand mathematical knowledge throughout the history of humanity, in the context of different interest groups, communities, people and nations (D' Ambrosio, 2001). I used the term ethno-mathematics to express the relationship between mathematics and Maithili culture. If teacher know the value of ethno-mathematics and start to link mathematics with student's culture, they will be able to engage students in mathematics classroom and know how to handle the multicultural group of students.

The term ethno describes "all of the ingredients that make up the culture identities of a group, language, codes, values, jargon, beliefs, food and dress, habits, and physical traits". Mathematics expresses a "broad view of mathematics which includes ciphering, arithmetic, classifying, ordering, inferring and modeling" (D' Ambrosio, 2001, p. 308). Ethno-mathematics is important for today's world. Because it helps to connect school curriculum with child's reality and helps to increase student active participation in the classroom. Ethno-mathematics is related to the development of students' competencies, abilities and skill through the study of mathematical ideas, procedures and practices directly connected to their own SCC (Rosa, M. & Orey, 2015).

Social Constructivism

Lev. Vygotsky (1896-1834) was famous scholar who emphasize on the social construction. Social constructivism is a theory among several theories on constructivism. Every knowledge in socially constructed and children learn when we got interact with outer environment either verbally of observantly. Vygotsky theory is one of them that regards social interaction between peers and adults an important aspect in creating meaning making sense and conveying culture within the context, knowledge in being unconstructed in social situation of negotiation rather than bring the reflection of the objectives reality which in termed as social constructivism. Social construction believes on the multiple constructions of the world. In social constructivist theory each human being makes sense of the world in a unique way Vygotsky argue that the child's development cannot be understand by studying the individual that it needs to examine the external world.

According to social constructivist Vygotsky knowledge in constructed in two ways in the social context. Firstly, social interaction influences the nature of knowledge that is

constructed and process of individual use to unconstruct. Thus, the constructions are socially centered as in value, process of understanding constructing of knowledge on children to gain of knowledge is process of observing, reflection of thinking, performing, practicing and creation. To fulfill each and every mathematical need applied mathematical concepts in their daily works but they didn't know the meaning about some of the applied concepts. The mathematics used several unique characteristics. The conventional mathematics concepts were embedded in the work.

The research is based on social constructivism a branch of constructivism Maithili has lived with their culture environment. According to social constructivism people gained knowledge and environment. Maithili also gains knowledge from their interaction among social, culture and environment. They have to fulfill their needs and experience. Their knowledge and concepts are transformed on junior person (Acharya, 2017).

Cognitive Constructivism

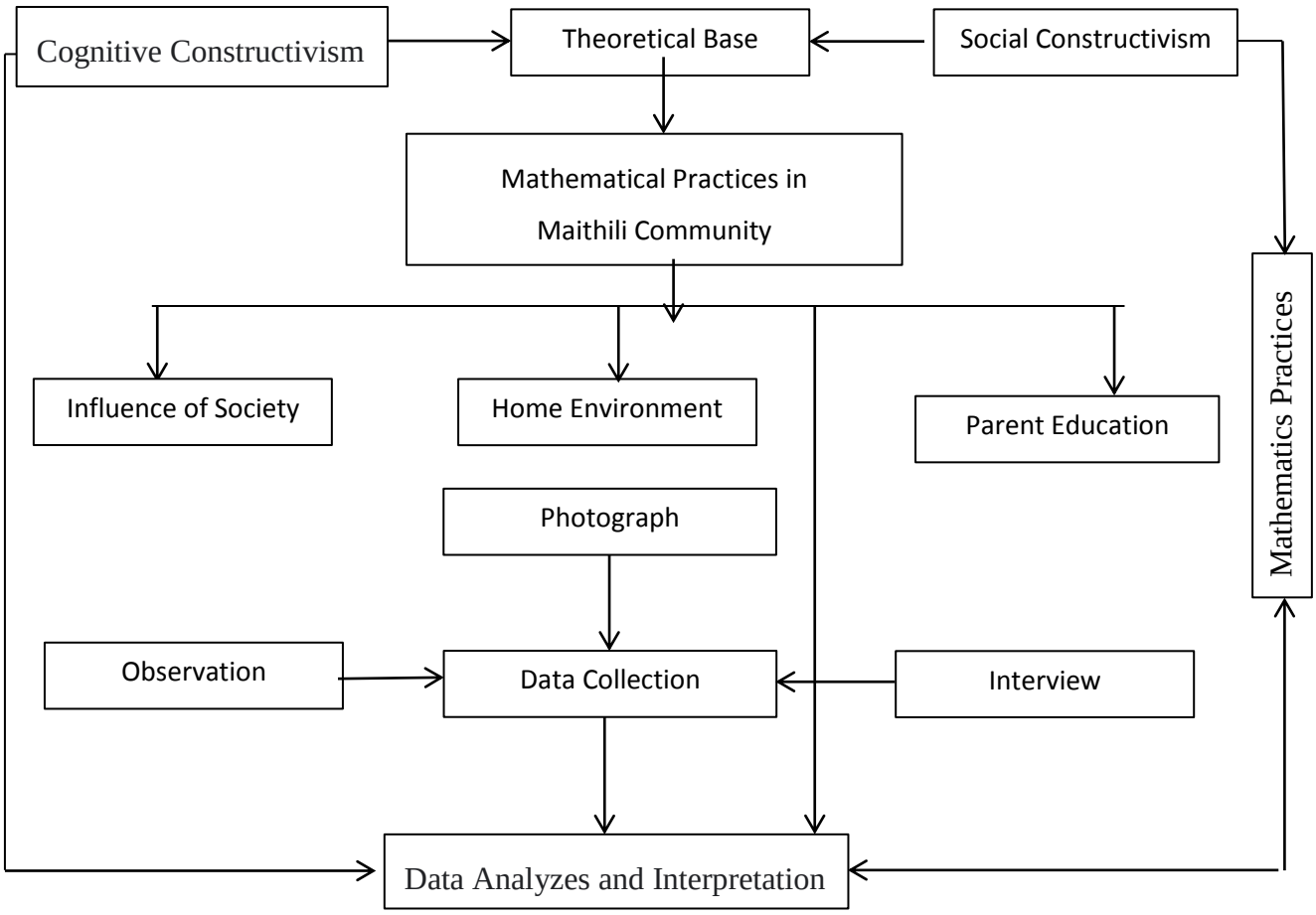
Cognitive constructivism is based on the work Swiss development psychologist Jean Piaget (1957). Piaget's theory has two major parts: 'Ages and Stages'. Cognitive perspective theories focus on both what people learn and the process by which they do so.

Piaget's theory of development process that human cannot be given "Information which they immediately understand and use instead, human must construct" their own knowledge. They built their knowledge through experience. Experience enables them to create models in their heads. The cognitive constructivism holds that perception or cognition is largely influenced by culture, environment, social, activities, language and the form that taken in shared interpretive schemes and organizational strategies. It says the human action. How we act in the world, guided by relevant intension and belief produced by our scheme of interpretation, the interpretive schemes suggest alternative lines of action. We then apply action schemes or strategies.

Conceptual Framework

Conceptual framework for the study is the way that organized the all the process of the research from initial stage to final stage. In this topic I prepared a concept for the study, which played the important role in guiding the research to achieve the determined goal. The basis of the development process of this conceptual framework was the specific objectives of this research because of the exploration and documentation of mathematical knowledge are the key concepts of this study.

Conceptual Framework



***(Figure)*,Sources: Chaudhary, A. (2014)**

The above framework has shown that the ethno-mathematics knowledge of Maithili community practices from their cultural perspective. The theoretical base of my research depends upon the social constructivism and cognitive constructivism. Social constructivism focus on importance of the culture and constructing knowledge practices based on understanding. My research is systematic, qualitative procedure used to generate a theory that explain, conceptual level process and interaction, influence of society, home environment, parent education about the substantive topic.

Chapter III

METHOD AND PROCEDURES

Research method does not only means to collect detail information but also means to use appropriate research method. In this chapter, I included interpretive as my research paradigm, ethnography as my research design, ontology, epistemology and axiology as my paradigm consideration. It provides a way to research about how to conduct the study. It helps the researcher to achieve the goals or objectives of the study. I have also mentioned transferability, credibility, dependability, conformability and praxis as quality standard in my study. The main components of the research methods are design of the study, population of the study, sample of the study, tools for data collection, data collection procedure, scoring procedure, procedure of data analysis.

Research Paradigm

The research paradigm of my study is interpretive. Interpretive research paradigm influenced strongly by anthropology which aims to understand other cultures, from the inside (Taylor and Medina, 2011). It focused on the social study of humanity. Interpretive researcher seeks the deep understanding about human culture. To gain the deep understanding about human culture, researcher spends considerable time in the field. Researcher sees the world through participant's eyes; understand their feeling, emotion, behaviors, pain and pleasure. Interpretive research paradigm is concern primarily with generating the context based understanding of people's thought, beliefs, and values associated social actions (Taylor & Luitel 2011). It emphasizes on the contextual understanding about the human cultures involving value, beliefs, thought, and behavior.

The main purpose of my study was to gain the deep understanding about the mathematics practices in Maithili community. Therefore, this research paradigm was most appropriated for my study, I have used interpretive research paradigm to explore how the everyday practices, cultural artifacts, to observe how they use mathematics in their culture and interpret my understanding about the field in a reflective way.

Applied to educational researcher, interpretive research paradigm enables researcher to build rich local understanding of the life world experience of teachers and student and of the

culture of classrooms, schools and the communities, they serve (Taylor and Medina, 2011). Interpretive research paradigm helps to build the rich local understanding of the day to day activity of cultures and relate student's cultural practices and mathematics classroom. This cultural knowledge is used to design mathematics curriculum materials for local schools to foster two way borders crossing between Nepal and Western worldview (Kathmandu University, 2008). So it helps me to relate student's culture practice with mathematics curriculum and mathematics teaching materials from local sources and reflected and interpret my live experiences of the field through the narrative way.

Ontology

The ontological questions are: what is the form of nature of reality and, what is there that can be known about it "how things really are" and "how things really work." (Guba & Lincoln, 1994). Ontology is the theory about the nature of reality. Ontology gives the valid and clear knowledge about the nature of reality.

The ontology position of interpretive is relativism. Relativism is the view that reality is subjective and differs from person (Guba and Lincoln 1994, p.110 as cited in Scotland, 2012). I believe on multiple subjective realities. There are multiple reality exist. I see and interpreted the reality according to my perspective but at the same time other researcher may interpret the same reality form the different way base upon his/her experiences, knowledge and belief. Therefore, Ontology of my research is subjective reality.

Epistemology

Epistemology concerns the nature, source and limit of knowledge. It is the assumption about how we can learn the world investigates issue and gain knowledge (Chamberlain, 2014). Epistemology is the nature of knowledge and understanding. It is about how we gain and investigate knowledge.

The interpretive epistemology is one of subjectivism, which is based on real world phenomena. The world does not exit independently of our knowledge of it (Grix, 2004, p.83 as cited in Scotlans, 2012). Knowledge is the outcomes of the human cultures and activity. Knowledge meaningful realities are constructed in and out of an interaction between humans and their world and are developed and transmitted in social context (Crotty, 1998, p.42).

Therefore, the social world can only be understood from the standpoint of individual who are participating in (Cohen et.al 2007, p.42). I explored the knowledge through interaction with Maithili observed their behavior and participated in their society. I have constructed and gained knowledge of mathematical practices in Maithili community through interaction, collaboration, participation in their work place.

Axiology

Axiology refers to the philosophy of value. The value of my research is especially cultural artifacts, rituals, ornaments, children games and farming. The problems and issues of axiology investigate with us from the moments man began to reflect upon condition of his life, the structure of reality, the order of nature and man's place in it (Hart, 1971). I have reflected my conditions of life, structure of reality, so my research can't be value free. Because of it may be influenced own personal experience, belief value, perception and my own reality, therefore, it is value laden.

Design of the Study

To meet the desired objective of this research, design of this study qualitative. Creswell (2011), divided qualitative research design into five main approaches. They are phenomenology, grounded theory, ethnography, narrative research and case study design.

The research designed of my study would be qualitative with ethnography approach. Ethnography is a qualitative research method and it is known as naturalist. The researcher tries to explore the mathematical concept, counting system, measuring system and geometrical knowledge of own traditional equipment by Maithili ethnic group. The basic purpose of ethnographic research is to determine the physical and social environment in which in individual under study. This study lays in the observation of natural behavior in a real life setting, free from the constraints of more conventional research procedures, it mentioned the objective of the purposed study and to make a good and systematically (Chaudhary, A. (2014*)*. The result of the study had done on the basis of the case study design because the study focused on to explore the mathematical idea of Maithili community at Sarlahi district.

Study Site

This ethnographic research aimed to find the mathematics concept and practicing among Maithili community. So, Maithili people of Lalbandi Municipality of Sarlahi district were the whole populations of the study.

Respondents of the Study

According to James G. Anderson (1979), there are no rules for qualitative inquiry. So, the sample size of this inquiry depends upon the researcher what want to know, what are the purpose of inquiry, what can be credibility of the study and what can be done with available time and resources. In order to, obtain information about mathematical concept and practicing among Maithili community and their pedagogical implication. For this purpose, I selected the some old people of Maithili community, also two parents, four students of Maithili community and two mathematics Maithili teachers purposively from Lalbandi Municipality, Sarlahi district. The selected person form different villages can give appropriate and actual information.

Tools for Data Collection

In qualitative research design, there are many procedures to get information during research. Basically, I collected secondary data from different journal articles, books and other published and unpublished document. I used the observation, interview and photograph to get primary data. The research tools that I described below briefly:

Observation

There are number of techniques to gather information. Observation is one of them. Observation concerns the recording of what is being observed. It is the most useful tool for the data collection in any king of research

At first, I would meet the people familiar with that study area. After getting information from them, I informed the senior person of the Maithili people about the purpose of the study and visit at Lalbandi Municipality. I took some information about the environment, culture, customs, profession and economic condition of that community by the help of senior person. I observe their daily life activities like playing, agricultures, life style,

houses hand, customs, cattle management, construction and other specific activities. I noted information on his note book. I observed about mathematical concept, counting system, measuring system and geometrical knowledge own traditional equipment. The study is conducted on work for 4 week observation at Lalbandi, Municipality. I also observed and identify their mathematical activities on the basis of their daily life activities.

Interview

Interview is an important method to collect primary data. It is a data collection procedures including verbal communication between the researcher and respondent by face to face situation. For this I prepared interview schedule on the basis of the suggestion from supervisor and the study of research book. The theories document and book related to Maithili community. When I reached the study area I met the Maithili people individually by the help of other persons.

First of all I informed then a both the objectives of taking interview and make good relationship with them. Then, I took interview with selected person on the basis of interview schedule. The questionnaire changed according to the interview's responses and situation. I listen carefully the interview's answer the observed their special expressions and the tone of their voices. The interview was taken to collect data about mathematical concept and practicing, counting system. Measuring system and geometrical knowledge of own tradition equipment. The information got from the interview will be written in the note copy.

Photographs

Photographs are important tool for research. I took some photograph of Maithili activities. Especially making wood, siki of thread, bamboo and clay works, making wool and their life style.

Data Collection Procedure

During the data collection period I would visited the area after selecting the title of proposal. It was easy for me because the social environment is not new for me. Therefore, I do not need to adjustment time with people where sample of the study more accessible. Then I discuss with the Maithili leaders, framers, senior adults and students. I also have visited their workplace, house, farms etc. for detail information. At that time, I take some photo and make field note. This data was collect by participants observation, interview.

Assessing Trustworthiness

Triangulation is a method that maximizes the validity and reliability of the data. Triangulation is a powerful technique that facilitates validation of data through cross verification from more than two sources. In this research data triangulation was used between the data collected from interviews, observations and document analysis.

Procedure of Data Analysis

Regarding data analysis and interpretation, I studied the recorded data several times to develop deeper understanding of narrative supply by research participants. It would help me to develop a detail description of their behavior, cultural setting, I translated audio-visual and recorded data in written form. While interpreting the data, I have created the rich environment of the field and expressed reality as far as possible.

My research was interpretive so that I reflected my personal experience in the fields; I also interpreted participant's behavior, activities, cultural in reflective way. "The foundation of ethnography analysis is the belief that information has cultural knowledge. By systematically examination an informant's word and environment, one can see the relationship among the parts. It is the examination of these parts that helps the researcher to understand the overall culture of informants" (Leech & Onwuegbuzie 2008). The collected information from the class observation, interview and community categorized according to the category of data and using thematic and triangulation method for data analysis. Finally, I analyzed the data by linked with different theories and literatures described in literature review section.

Quality Standards

Generally, quality standard is a way of judging the quality of research. It is necessary that the quality of the data and then their analysis is to maintain. Tracy identifies eight key markers of quality in qualitative research: worthy topic, rich rigor, transferability, credibility, praxis, resonance, ethics and meaningful coherence (Guba & Lincoln (1994). And I have addressed transferability, credibility, dependability, Conformability and praxis as quality standards in my study:

Transferability

By transferability, a research activity or its product can be transferred to another setting or context by identifying similarities and dissimilarities between the researched and will be research site (Guba & Lincoln, 1989, 2005 as cited in Luitel, 2009) other context and in their own situation.

In my research, I mentioned this quality standard by judging and exploring the importance of ethno-mathematics in school mathematics. I think it is useful for these researchers who want to explore the relationship between culture and mathematic. They transfer my research agendas in their own context. Readers can identify their own cultural practices, which are related to mathematics and start to practice and apply in mathematics pedagogy. I provided the rich description for the readers so that they can compare their own real world situation, social context with social setting of my research.

Credibility

Credibility refers to the degree to which the research represents the actual meanings of the research participants, or the "truth value" (Lincoln and Guba 1985).

Credibility is about the researcher undertaken prolonged immersion in field, check his/her informants, and display a process of learning (Taylor & Medina, 2011). To maintain this quality standard, I spent the considerable time i.e. Prolonged engagement in Maithili community. From prolong, engagement, I gained the deep understanding about Maithili community so that I provided thick and rich description and information for readers about the process of my research and finding.

Dependability

Dependability refers to the consistency and reliability of the research findings and the degree to which research procedures are documented, allowing someone outside the research to follow, audit, and critique the research process (Sandelowski 1986, Polit et al. 2006, Streubert 2007).

I have used many document of research design and implementation includes the methodology and methods, i.e. the details of data collection (e.g., thesis, review paper, field notes, journal article, notes etc.) includes for my study. This study was developed from the early stages through a systematic search of the existing literature review.

Conformability

The degree to which the findings of the research study could be confirmed by other researchers. Conformability is concerned with establishing that data and interpretations of the findings are not figments of the inquirer's imagination, but clearly derived from the data. (Lincoln and Guba 1985). And I have discussed about the conformability as triangulation.

In this research data triangulation was used between the data collected from interviews, observations and document analysis. I have collected the data at different points at same time. Also I took more sites and from more than one level of person (i.e. from two groups). I stayed long term at the study site and repeat observations of similar phenomena and setting occurred on- site over three month period of time.

Praxis

According to Taylors and Wallace (1996, p.1) "Praxis concerns the way in which the researcher attempts to stimulate the readers to take deliberate action towards changing practice". This study invites readers to reform in their teaching and learning process and start to link mathematics with student's culture. Mathematics is practicing in our daily life and uses those cultural practices in mathematics teaching. According to (Kemmis & Smith, 2008), " Praxis is what people do when they take into account all the circumstances and existences that confront them at a particular moment and then, take the broadest view they can of what is best to do, they act".

From pedagogical perspective, it is important that teachers are knowledgeable and skillful practitioners, but good mathematics teaching is more than knowledge and techniques-it is form of praxis. Praxis is a particular kind of practices that emphasize the moral, ethical and caring dimensions of teaching (Grootenboer, 2013).

In this study, I used praxis in terms of teaching is not only knowledge and techniques it is about moral, ethical and caring dimension of teaching. Therefore, the teacher needs to maintain the warm and deep relationship with her/his students so that learners or students have extra support when they need and it helps to developed student moral, ethical and caring dimensions.

The readers will be invites to assess whether the report arouses pedagogical thoughtfulness in them as they read through the report as a way of checking whether praxis is achieved (Taylor, 2004).

Ethical Considerations

It is this ethical principle that generally deals with the distinction between what is right or wrong, proper or improper, good or bad, and an acceptable from the unacceptable in conducting research (McMillan & Schumacher, 1993), I have to be aware of ethical issue in my research. If I have not being aware of ethical issues there may be risky in my whole research. We informed consent from the participants, which helped build rapport and trust between the researcher and the communities.

The issue of anonymity and confidentiality of respondents is related to the rights of beneficence. I maintained confidentiality that goes beyond ordinary loyalty. Each and every respondent were free from being pressurize by the researcher and name of the respondents will not be disclose. But the information related to the mathematical knowledge which is desired by the objective of this research id documented in the findings of this study.

I informed to the participants protect and guarantee and no harm them. It would help to the find out mathematical concept and practicing on Maithili community and their pedagogical implication. It would also help me make easy for prolonged to maintain ethical issues and maintain pleasure from inside the Maithili community. I mentioned of jargon and understandable for all. I explored and interpret honestly what I find the mathematical practices in Maithili community.

Chapter IV

DATA ANALYSIS AND INTERPRETATION

Generally, the data analysis and interpretation is the process of assigning meaning to the collected information and determining the conclusion, and implications of the findings.

This is an ethnography study related to mathematics concept practiced in Maithili community. The major objectives of this study were to explore "the mathematical practices in Maithili community and their pedagogical implications". The respondents of this study were the Maithili peoples who know Maithili culture, language, linguistics etc.

The respondent's right to autonomy is strictly protected. Triangulation was used between the data collected from interviews, observations and document analysis for the assessing trustworthiness of the findings of the study. I spent considerable time in the field to fulfill my thesis purpose. Especially, I observed their daily activities such as cultural artifacts, clay works, basketry, farming etc. Thus, the obtained information were analyzed and interpreted under the following main themes obtained in the process of data analysis:

- Geometrical practices in cultural artifacts;
- Geometrical practices in Basketry works;
- Geometrical practices use of cow/buffalo dung works by Maithili's
- Geometrical concept in Wooden and Bamboos works;
- Some mathematics implication goods.

Geometry in Cultural Artifacts

It was March 29, 2021. I have just arrived in my home from Kathmandu to celebrate our big festival Holi. This time was different from other Holi because I wanted to celebrate Holi as well as collect data for my research study. I was very excited of jargon and understandable for all. I explored and interpreted what I found the mathematical practices in Maithili community.

From April 5, I started my field, Visit started from my own home. My first observation was Piriha which my mother made. It had a beautiful pattern of circle. Next observation was Jaata of my own home. That day, I took some photos of cultural artifacts; I discussed them in detail about their cultures. I completed my first day field visit by observing few cultural artifacts, which are related to mathematics directly or indirectly. The simple observation that phenomena one might see every day have mathematical potential became interesting debate that quickly turned this observation into on exploration of the mathematics inherent in common architectural detail (Orey & Rosa, 2015). Those cultural artifacts were interesting and they had a lot of mathematical significance.

Geometrical Practices in Basketry Works by Maithili

Throughout the observation and interview, I found that the Maithili people are different technique for making different kinds of baskets, mats, traps, and the like so on. However, mentioning the techniques used by the Maithili and the baskets that they make with them, it would be better to offer a brief explanation of all the unknown techniques of basket work and a little detail on of those used by Maithili (Parents, Teachers, Farmers view). Some basketry is practices using mathematical concepts which describes a below:

Daliya (Mujela)

Daliya

This is a semi conical basket which has a slowly reduction outline. It has over flat foundation with stand. It keeps the base of the basket a few centimeters above the ground. The daliya has a rounded mouth normally 25-30 cm in diameter, having a base of about 5-7 inches diameter and a height of 8-10 inches. Their sizes usually depend on the wish of its weaver. The daliya made of Khar and kar using the simple over sewn coiling procedures.

Coiling begins at the base keeping in mind the preferred design. The stand for the daliya is made separately and latter stitched on the base. The daliya is extensively decorated using special decorate materials such as beads, cloth woolen, and mirror pieces of colorful are carried by every Maithili bride after her grooms as part of her dowry.

Pedagogical implications

In this figure (daliya), we can see different geometrical pattern. It is conical shape. We can use this figure as a teaching material while teaching cone and tessellations. Maithili community child practices and uses in their daily life therefore they can understand easily about the concept of cone and tessellations for school level mathematics while using this figure.

Bhauki

It is prepared by employing the simple over sewn coiling techniques and has a snail base. Khar is used for make the twist ling coilar base with Kar as the stitching strips. This basket is globular in shape normally having a diameter of about 45-50 cm at its mouth(opening). It is prepared in such a way that its greatest width is at the middle and it decrease uniformly to form the mouth and down to the base. The basket may also be in the shape of a globe cut into half. In such a case, the greatest diameter is at the mouth and is generally 50-60 cm wide. This basket is used for storing food grains such as rice, wheat, and pulses. It takes 5-7 days to complete. Starting from the base, Khar coiled up a Kar strip is put into the eye hole of the takwari (suiya) and Kar is used for stitching the coil. The spiral base (coil) is put in the most wanted shape and each stitch passes oven a new portion of the coil shooting a segment of the coil below. This process continuous until the previous colil and the Kar stripe passes through it once a thread of the Kar is totally coiled, it is pushed into the coil and new thread is use beginning from the same place.


Triangular Design
Dual Conical
Center


Curve pattern
Dual Conical

Bhauki

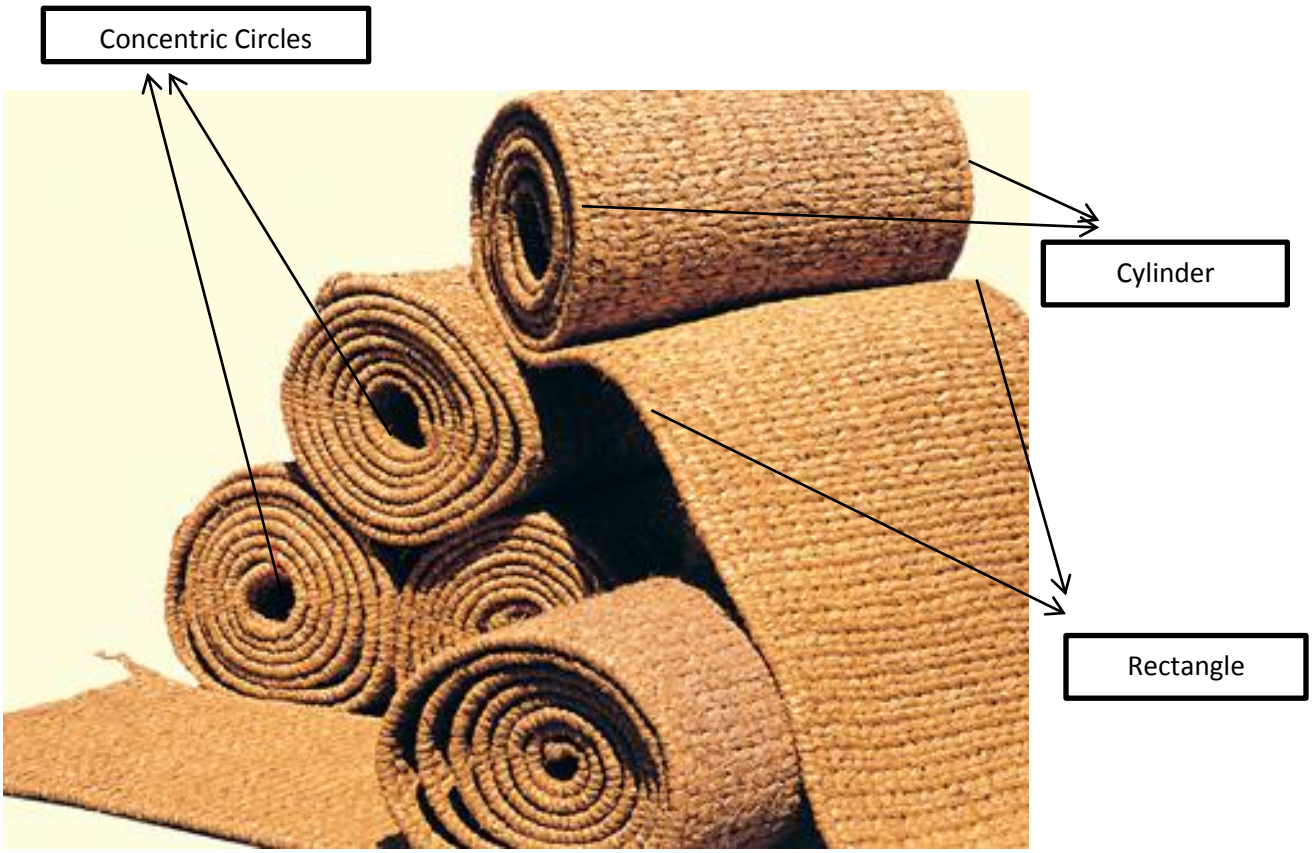
Pedagogical implications

It is three dimensional big baskets. The design of Bhauki is beautiful with mathematical flower and geometrical pattern. The bottom of conical shape is short in comparisons to upper part. Greatest width is at the middle and decrease uniformly line, edge base, radius, surface, area, volume, diameter, flat surface, tessellation, pattern, parallel line, curve, triangular design and so on.

Mat

Mats of the significant items are made by the Maithili using the basketry techniques. Three different types of mats are found. It is made by employing the different basketry techniques. These are

1. Chattai (Sukul)



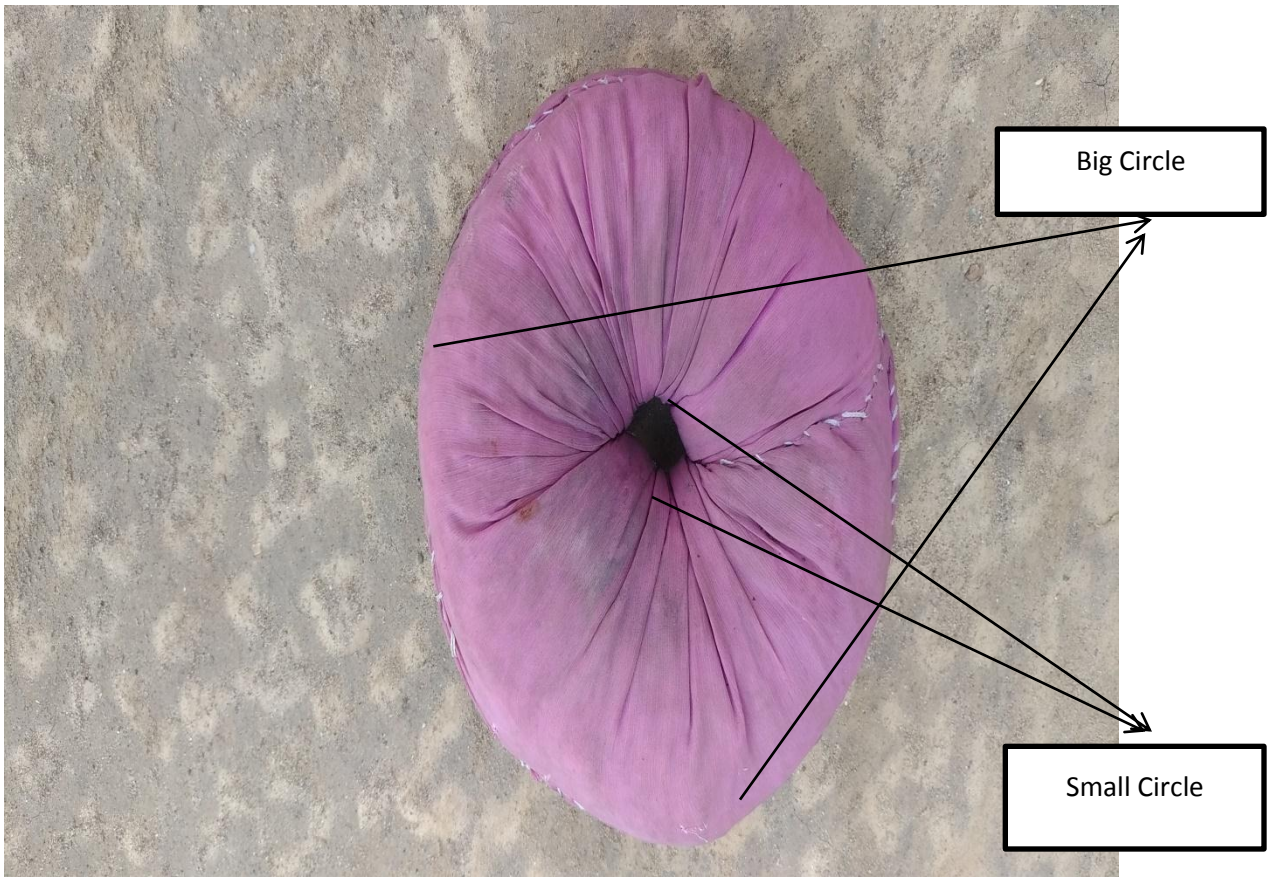
Chattai (Sukul)

This is a mat made out of paddy stalk locally called Chattai. The wrapped procedures are working for making the Gundri. The wrapping strand, a rope in this case passes round the bundle of paddy stalk passin, over two and under one bundle. This process is continued until the desired length is achieved after which the rope is tied into a knot and passes between the last bundle at a short distances, and the process is continued. Therefore, a mat is wrapped at distances of about 30-35 cm. throughout its breadth to ensure that it is tight enough and the stalk do not begin to come off after some time. The process of wrapping is completed if the sides are finished. Apart from sitting this mat is used as a mattress in winter for sleeping because it provides heat.

Pedagogical Implications

It can be used to teach mathematical concept of relation between volume of rectangular and volume of cylinder, area of rectangle by practically etc.

2. Birbaa



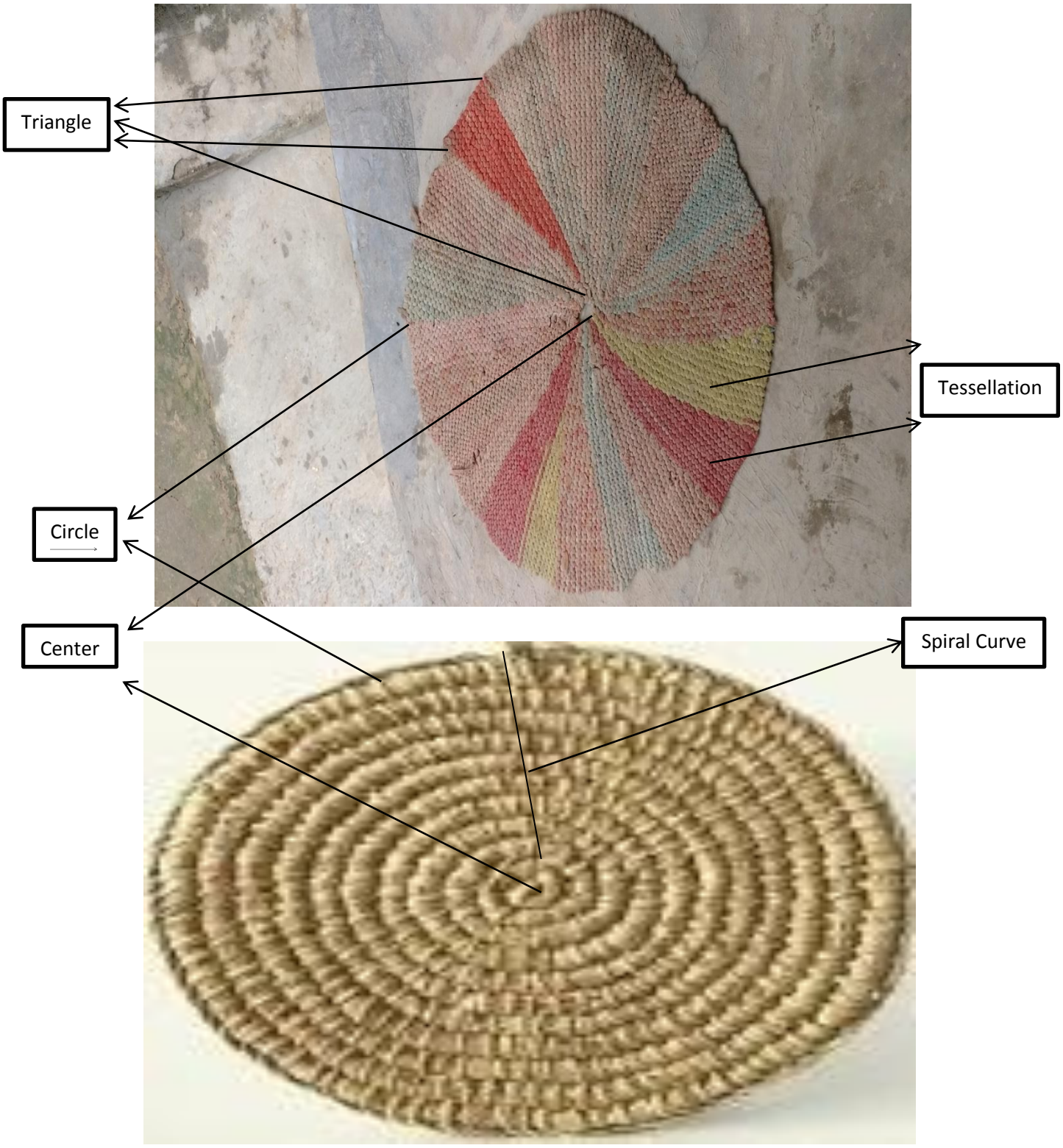
Birbaa

A ring used to hold pot or luggage on the head. The design of triangular, parallel, line, pattern, vertical line pattern and flower design are made to make it beautiful. The different color is also used for balancing the load Maithili use it to put on head.

Pedagogical Implications

It provides clear concept of circle and their solid area. It helps to teach are of ring that is area of big circle and are of small circle.

3. Birchhi



Birchhi

The birchhi is a cushion like mat having a length or diameter or 25-30 cm. it may be found in round, oval, and square or rectangle shape depending on the will of the maker. It is used for sitting several Birchhies are found in every Maithili house community. It's basically two types of Birchhies, one which made by cloths and another which made by paddy (Dhan ko Jhhati). The plaiting techniques is used to make the Birchhi in which a bunch of stalks is tied with rope at one end and plaited after dividing the bunch into 3 equal parts. The Birchhies can be made either by one single plait or by stitching two plaits next to each other in such a way that the joints is not shown. Once, a plait of the desired size is made, it is either coiled or folded into the desired shape. The end, which is tied with rope, passes through the plait with the help of Suwaa (awl). One method is that this rope is tied round the Birchhies to hold the plait in place. Another method is sometimes adopted in which instead of a rope, a strand of Kar or cloths or paddy stalk is used of tying it round the Birchhies. The sides of the plait are stitched neatly to the previous layer providing the desired shape.

Pedagogical Implications

It helps (Birchhi) to teach the secondary level students about the concept of concentric circle, center of circle, radius, triangle, and also to find out the area.

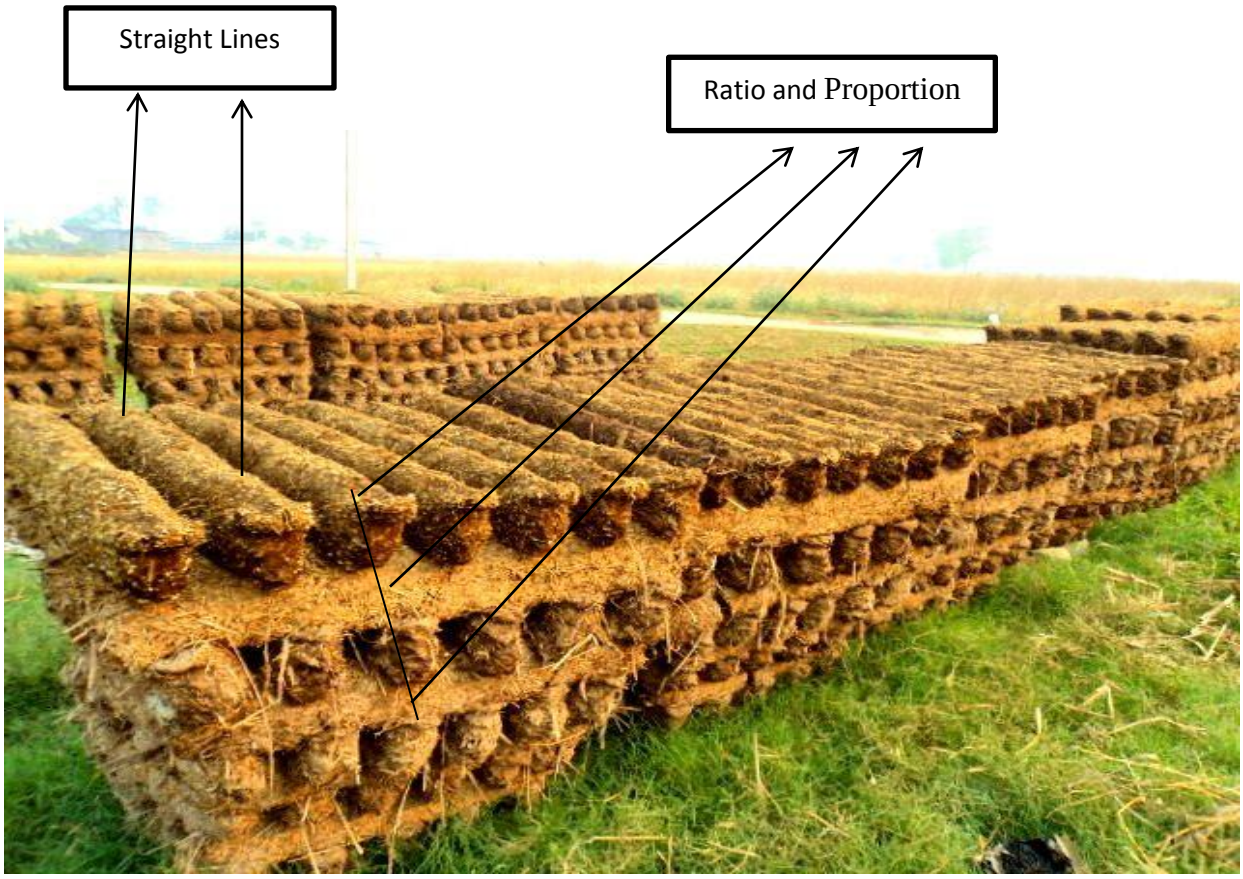
Geometrical Practices Use of Cow/Buffalo Dung Works by Maithili's

1. Goraha

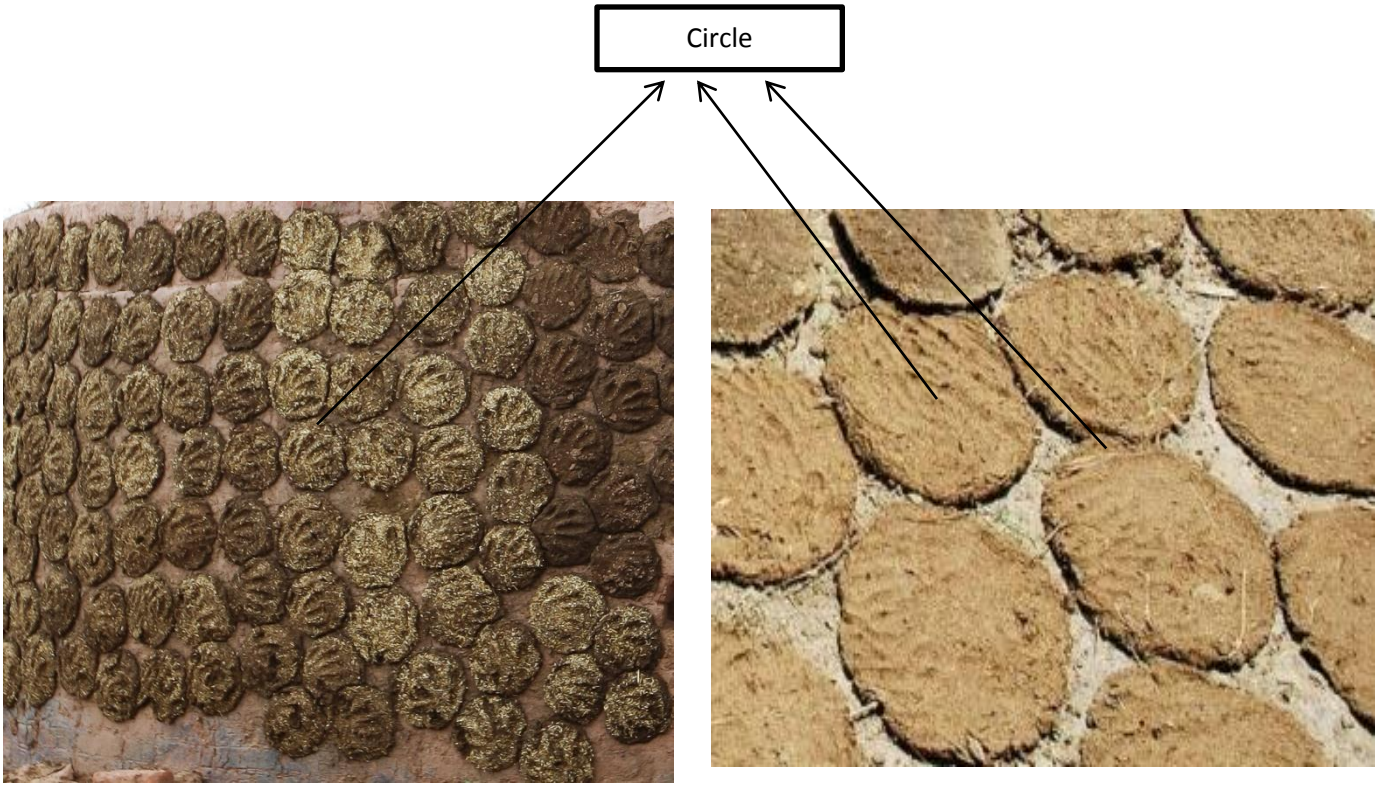
Generally, Goraha is the mostly useful firewood in Maithili community. Maithili community is specially used of dung as alternative to firewood. Around 70 to 80 percent of households in the Maithili community have been using Goraha for cooking.

Specially, women using cooking after made by cow dung. fresh dung stock near grass ground any time women's this fresh dung mixing dry grass, wood stick row made by step by step build by dung building. In the local language, there are different name of Goraha, likewise Chipari, Guinthas and it can be found various shapes and sizes likewise Circularly, Straight, Spiral and so on.

Pedagogical Implications



Goraha



Goraha/Chipari

Pedagogical Implications

In the figure (Goraha), we can see different geometrical pattern. Like Ratio and Proportion, Circle, Straight line and so on. Maithili community practices and uses in their daily life therefore they can understand easily about the concept of Ratio and Proportion, Circle and so on for school level mathematics while using this figure.

Geometrical Concept in Wooden and Bamboos Works

Generally, wooden and bamboos is the most useful materials of local community. In the case of Maithili community there are many types of materials made by wooden and bamboos. Likewise Dhekhi, Khatiya, Marbaa, Machhena, Tayer (Bail Gada), Jhakha, Bena, Dagara, and so on.

However, mentioning the techniques used by the Maithili and wooden and bamboos that they make with them, it would be better to offer a brief explanation of all the unknown techniques of wooden and bamboos work and little detail on of those used by Maithili. Some wooden and bamboos are practices using mathematical concepts which describes a below,

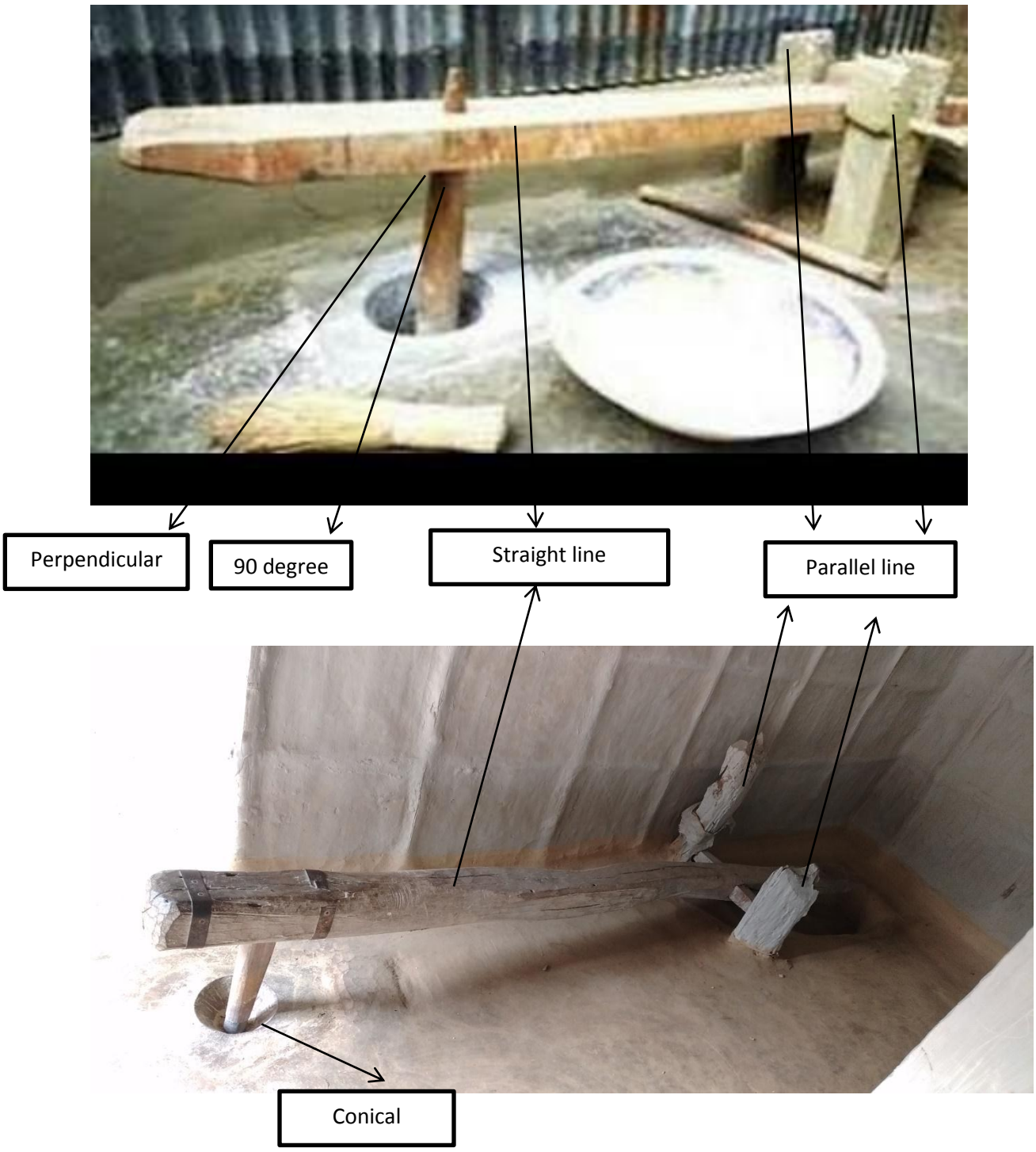
Dhekhi

Dhekhi is a one of the most useful traditional materials which are made by wooden. It is a king of traditional machine which is used to for beating paddy, maize, rice, wheat etc. to construct this Dhekhi; firstly they buried the two poles of the land in such a way that they are mutually perpendicular.

The manual wooden thresher Dhekhi is made of wooden and works like a lever, but is instead used for grinding. The framework consists of a falcrum having two pillars on each side, an effort area (where one person stands on the long thick plank of wood making effort at every interval), and a long and thick plank of horizontal wood which has a small vertical extension that goes into a hole made in the ground.

Pedagogical Implications

It can be (Dhekhi) used to teach mathematical concept of difference between perpendicular and parallel line, also straight line, conical and etc.


Perpendicular
90 degree
Straight line
Parallel line
Conical

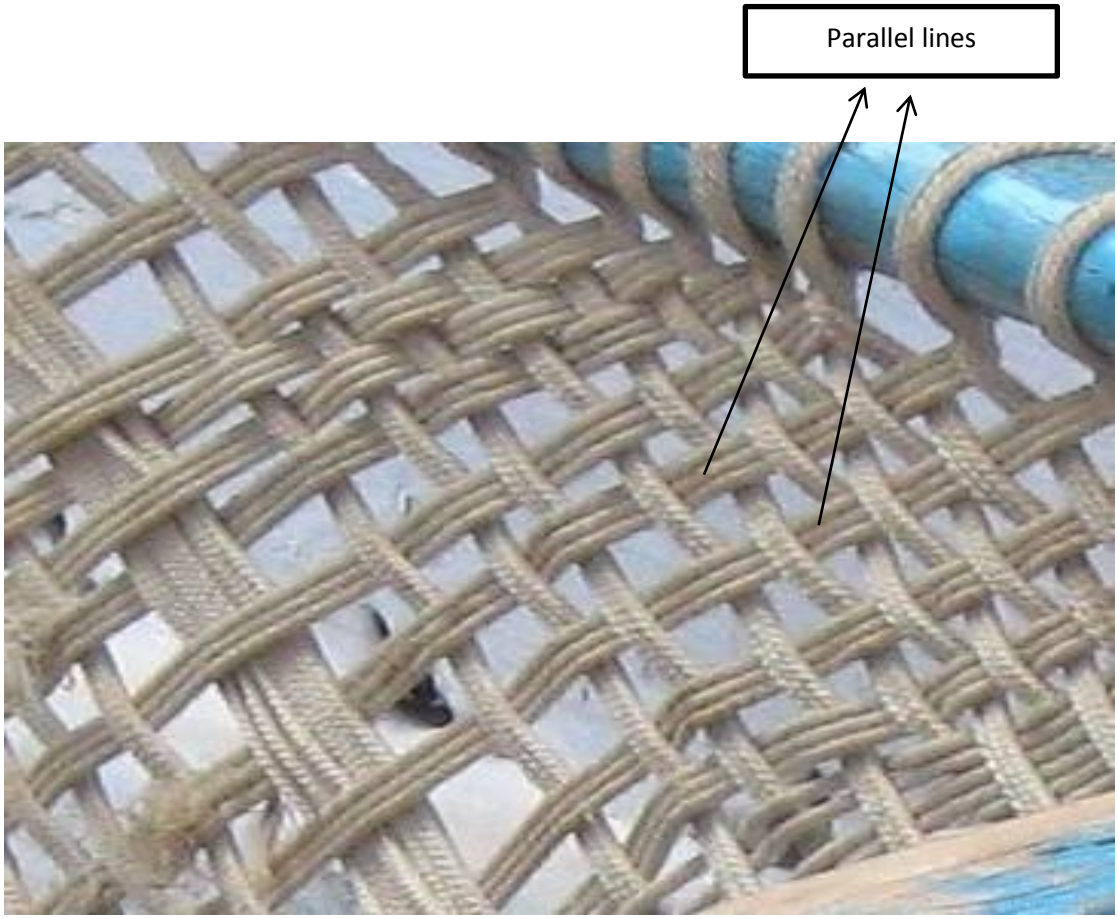
Dhekhi

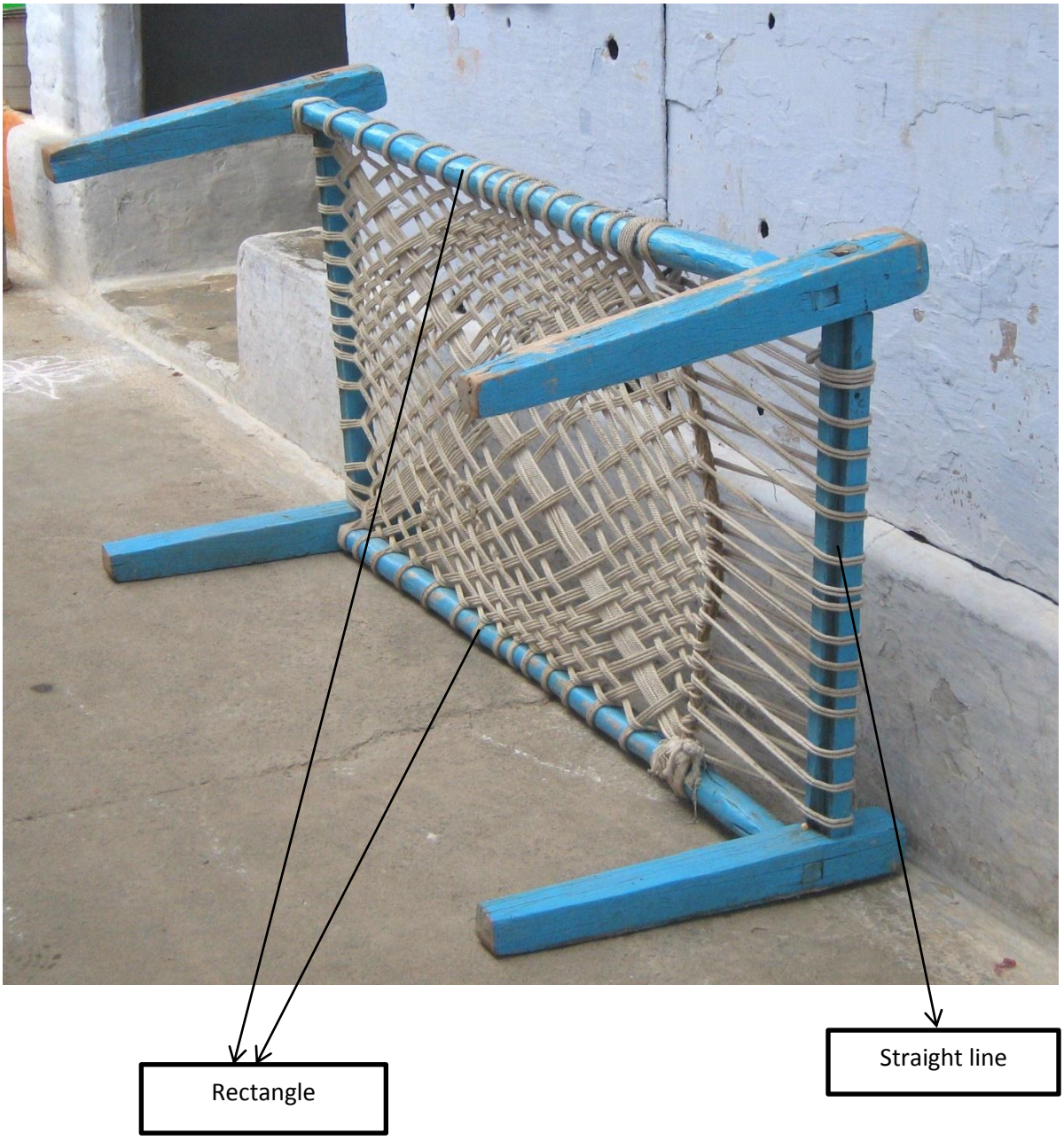
Khatiya

It is a kind of cot use for sleeping by Maithili community. It was found in the research that, for the information for the cot, firstly they prepared four legs in equal size and four supports made up of wood and bamboo. Among the four supporters, two were short and other two were long. Then, they connected the supporters with upper part of cot, they knitted the net with the rope tactically connecting breadth and length with mutually inclusive so that the net becomes cross diagonal. On the completion of the cot, there seemed many rhombus and square to fulfill the shape of big rectangle.

Pedagogical Implications

It helps to teach that how construct the rectangle, and diagonal, parallel line, meaning of mutual perpendicular.





Khatiya

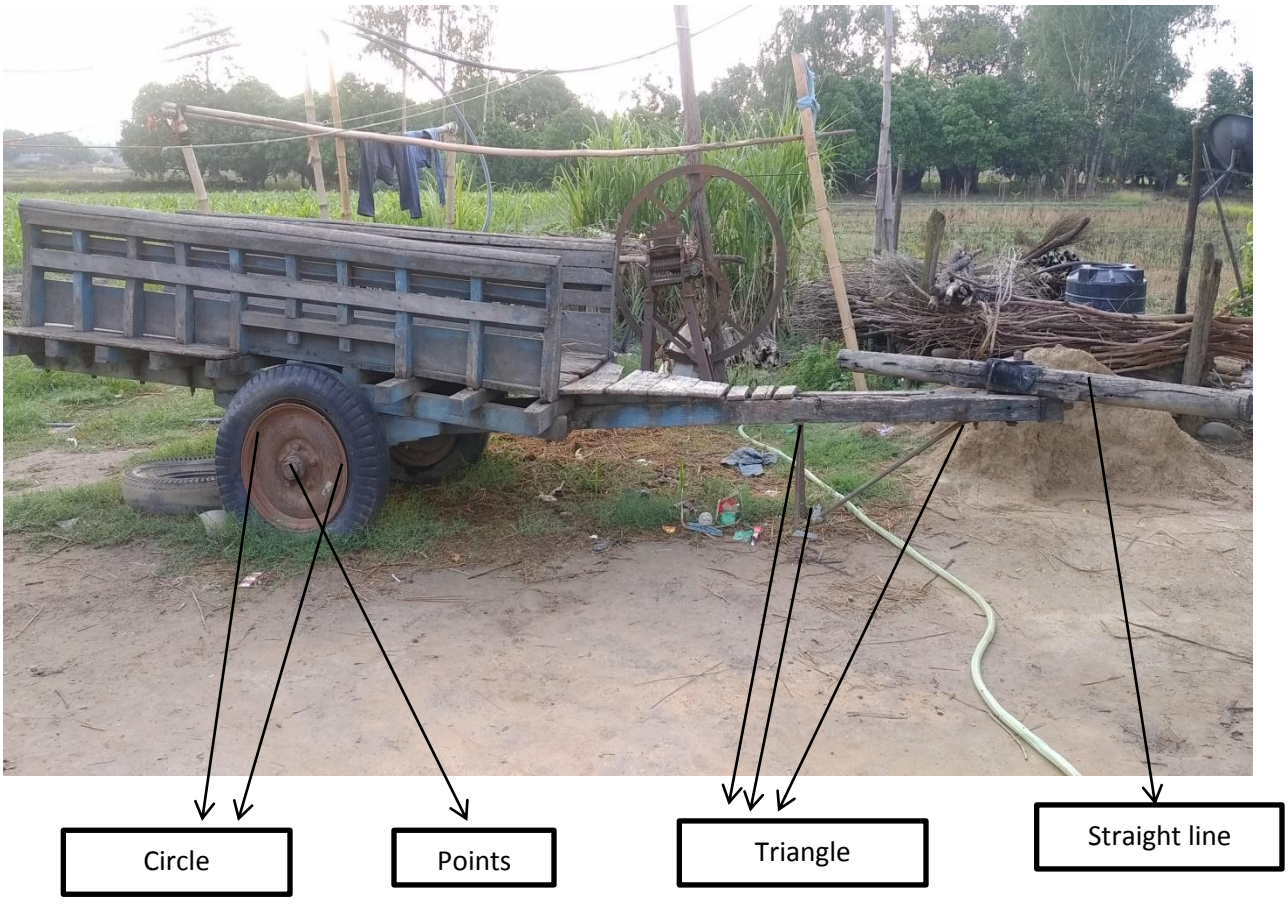
Tayer (Bail Gada)

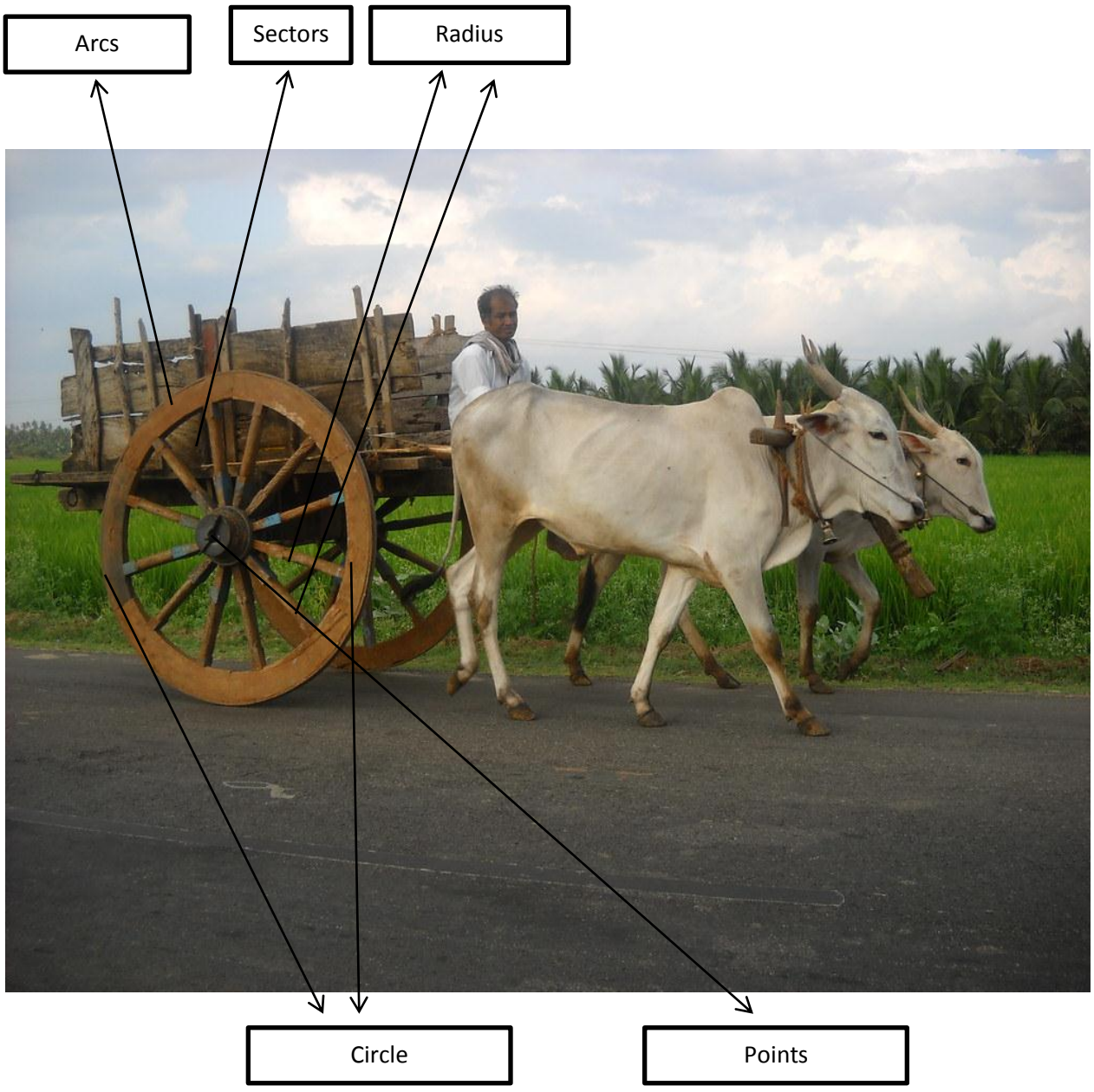
Tayer (Bail Gada) is a small bull cart which is made by wooden which is a two-wheeled vehicle pulled by oxen. It is a means of transportation used since ancient times in many parts of the world.

Used especially for carrying goods, the bullock cart is pulled by two oxen. The driver and any other passengers sit on the front of the cart, while load is placed in the back.

Pedagogical Implications

This is traditional goods for using different purpose of human life. It can be applied pedagogically in secondary level for teaching concept of circular, rectangular, parallel lines, points, angles, rotation, transformation, reduction, reflection and other so many mathematical concepts can be dealt with help of this Taye (Bail Gada).



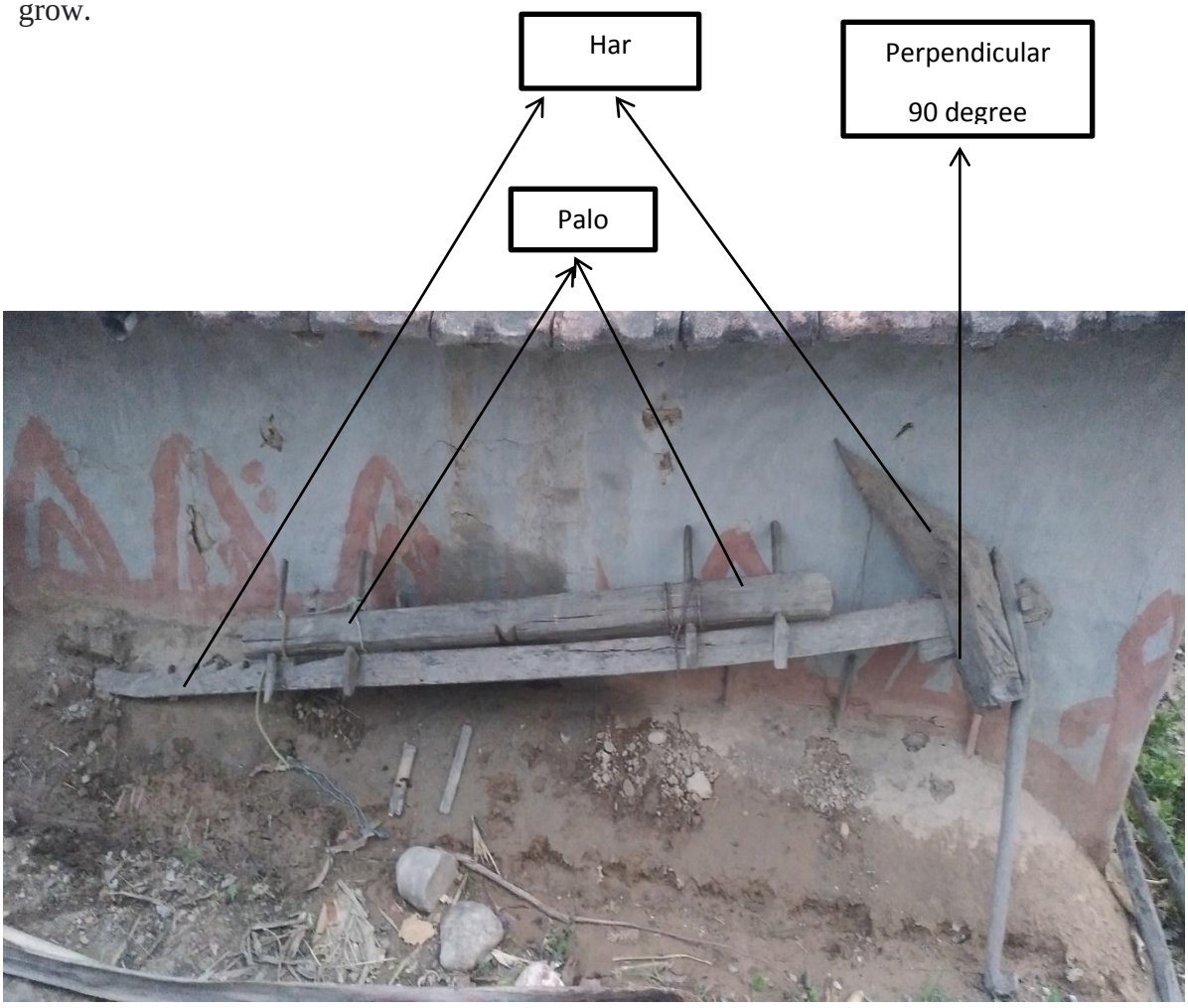


Tayer (Bail Gada)

Har and Palo (Halo/Plough/Plow)

Har and Palo which is also known as Halo or Plow. A plough or plow is a farm tool for loosening or turning the soil before sowing seed or planting. Ploughs were traditionally drawn by oxen, but in modern farms are drawn by tractors. In the context of farming it is most useful tool which is made by wooden.

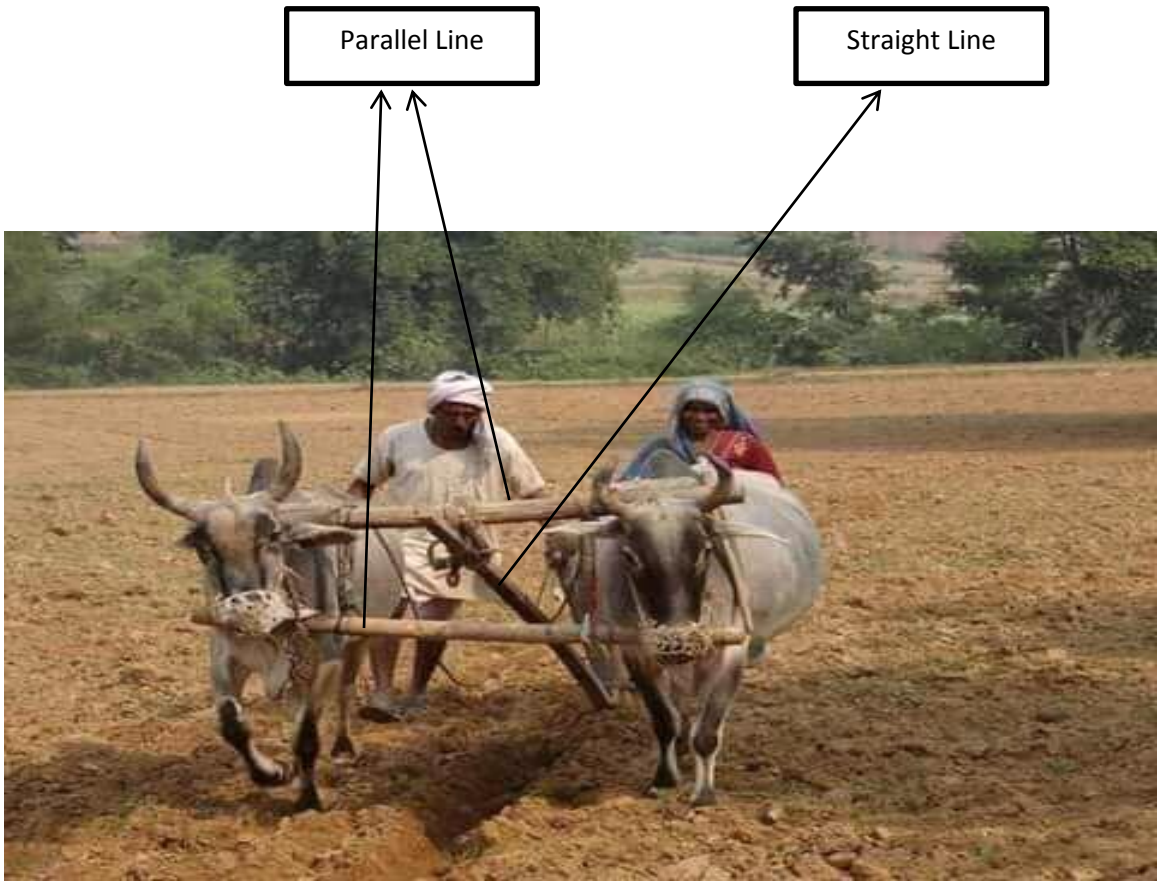
The prime purpose of Plow is to turn over the uppermost soil, bringing fresh nutrients to the surface while burying weeds and crop remains to decay. Plow and cultivating soil evens the content of the upper 12 to 25 cm. (5 to 10 in) layer of soil, where most plant-feeder roots grow.



Har and Palo (Halo)

Pedagogical Implications

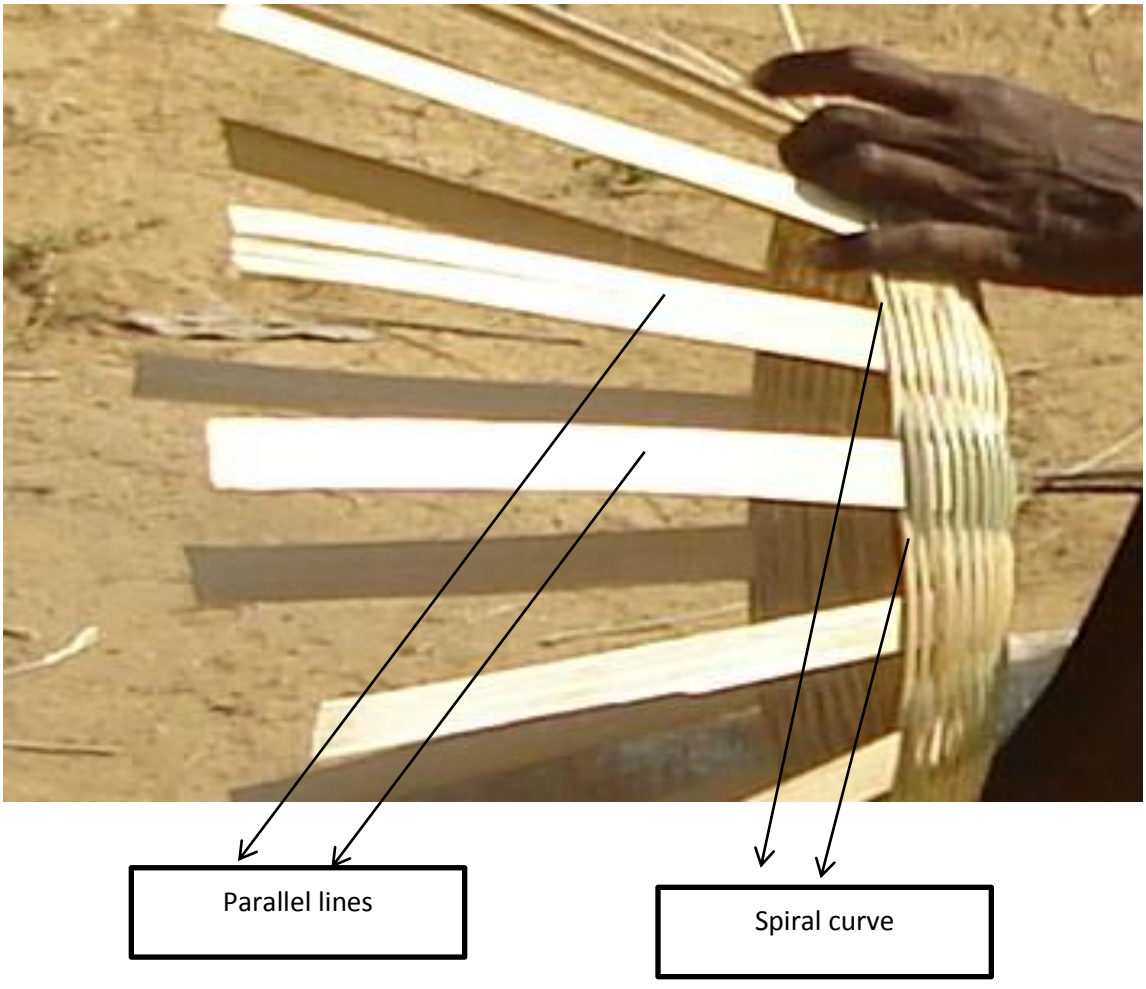
This is traditional tool for using different purpose of framing. It can be applied pedagogically in secondary level for teaching concept of length, straight line, parallel line, and perpendicular line and so on.

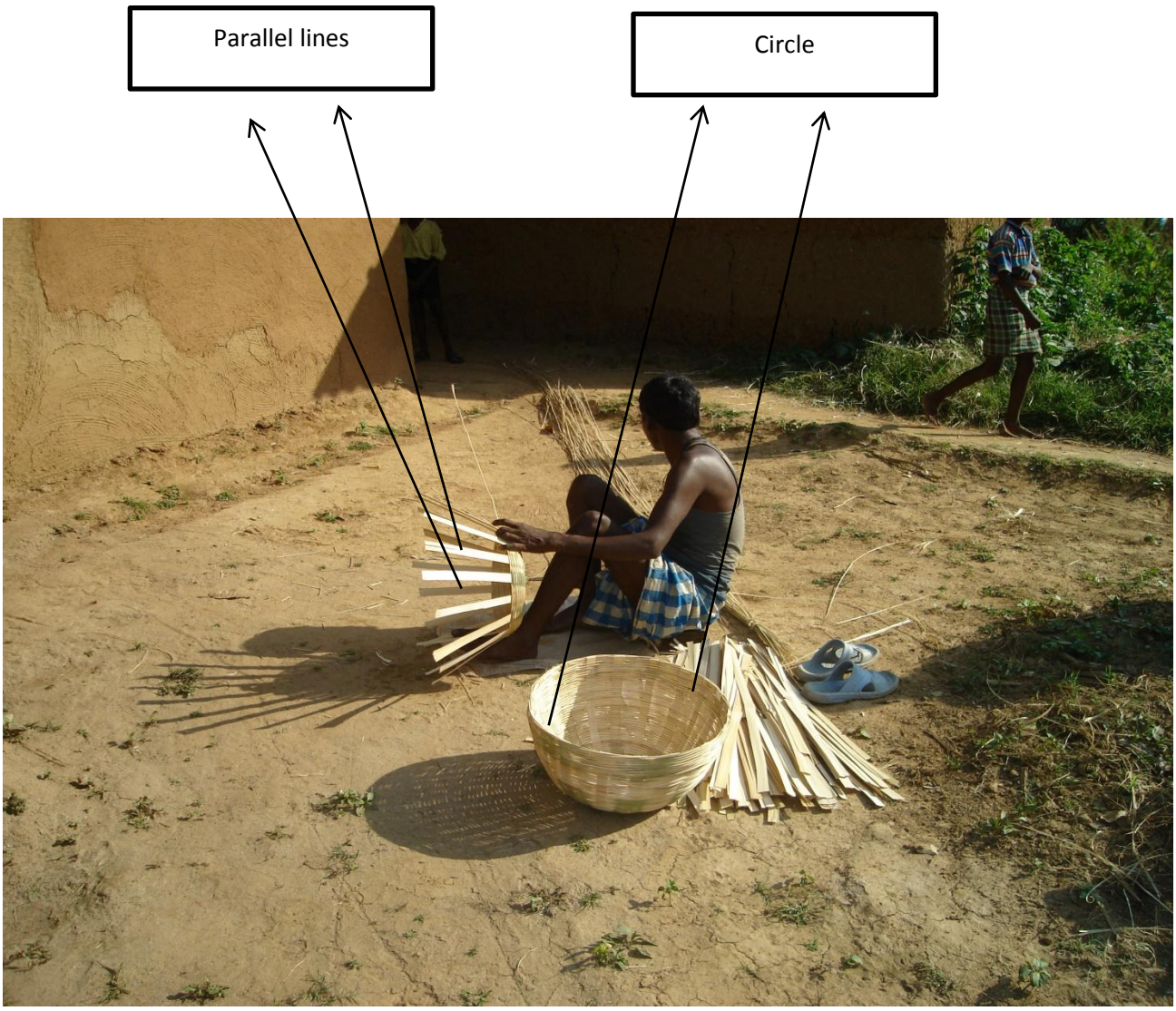


Har and Palo (Halo)

Chhitti (Dhaki)

In Maithili community, Chhitti (Dhaki) is one of the most useful traditional materials which are made by bamboo. It is simply prepared in such a way that is increase uniformly to from the mouth from up to the base which is specially oriented circularly. This Chhitti (Dhaki) is used for storing food grains such as paddy, wheat, pulses and also sometimes firewood. It takes 2 or 3 days to complete (starting from the base used of 10-12 part of little bamboo joint then used of spiral curve bamboo as like put in the most wanted shape like circularly. And this process continues, finally Chhitti is complete.)





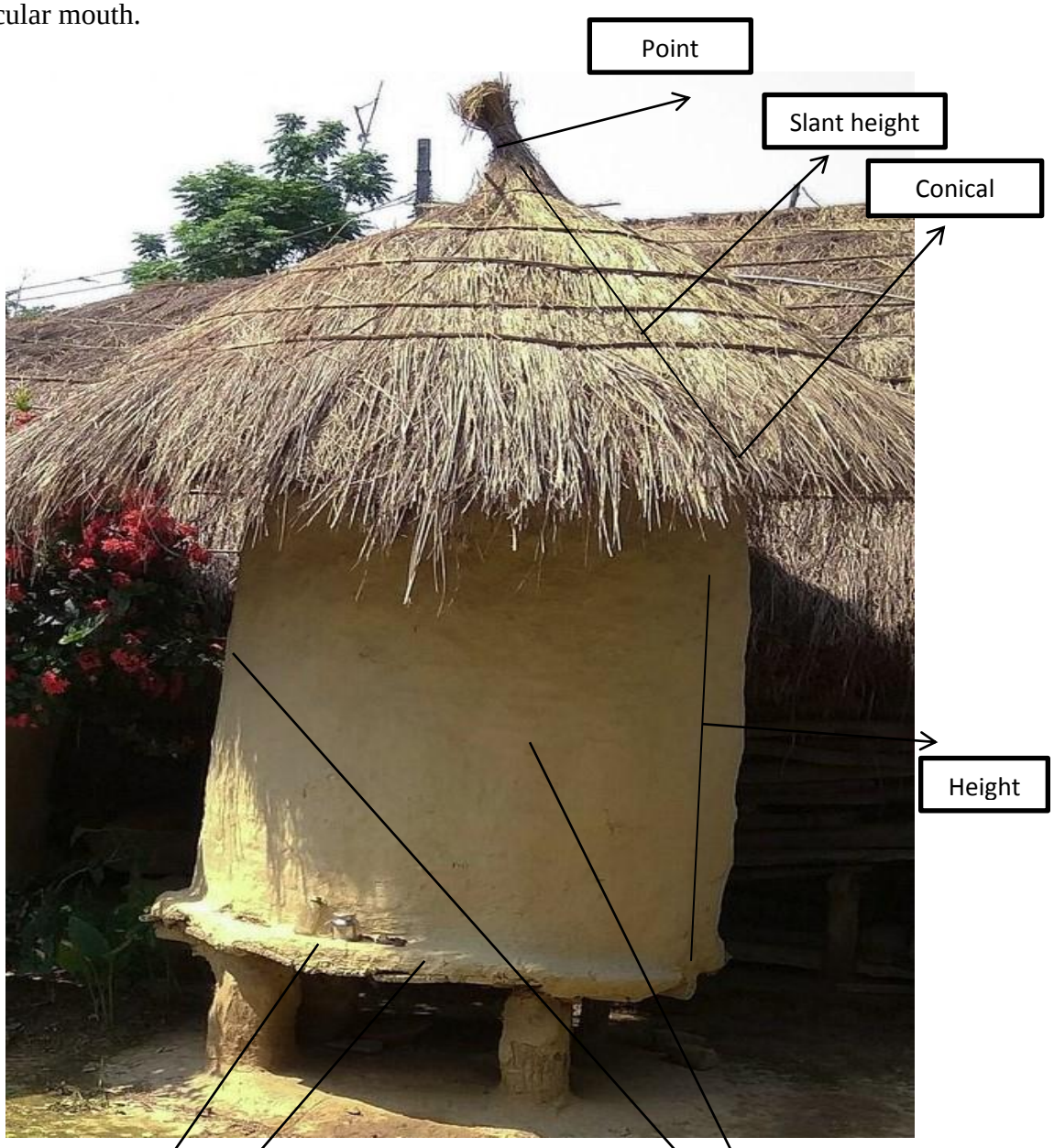
Chhitti (Dhaki)

Pedagogical Implications

The design of Chhitti (Dhaki) is beautiful with mathematical flower and geometrical pattern. It can be used to teach mathematical concept of Parallel line, spiral cure, tessellation and so on.

Berhi (Kothhi)

Berhi is one of the most useful materials in the Maithili community which are made by bamboo and wooden. It is also known as Kothhi and in Nepali language it is also said Bhakari. Maithili community is the specially used for storing grain such as paddy, wheat, pulses and so on for a long times (1 month or 3 month or 6 month or 1 years). Because of its shape, its shape is more difficult and complicated to make. It looks like the squash container, has circular mouth.



Berhi (Kothhi)

Pedagogical Implications

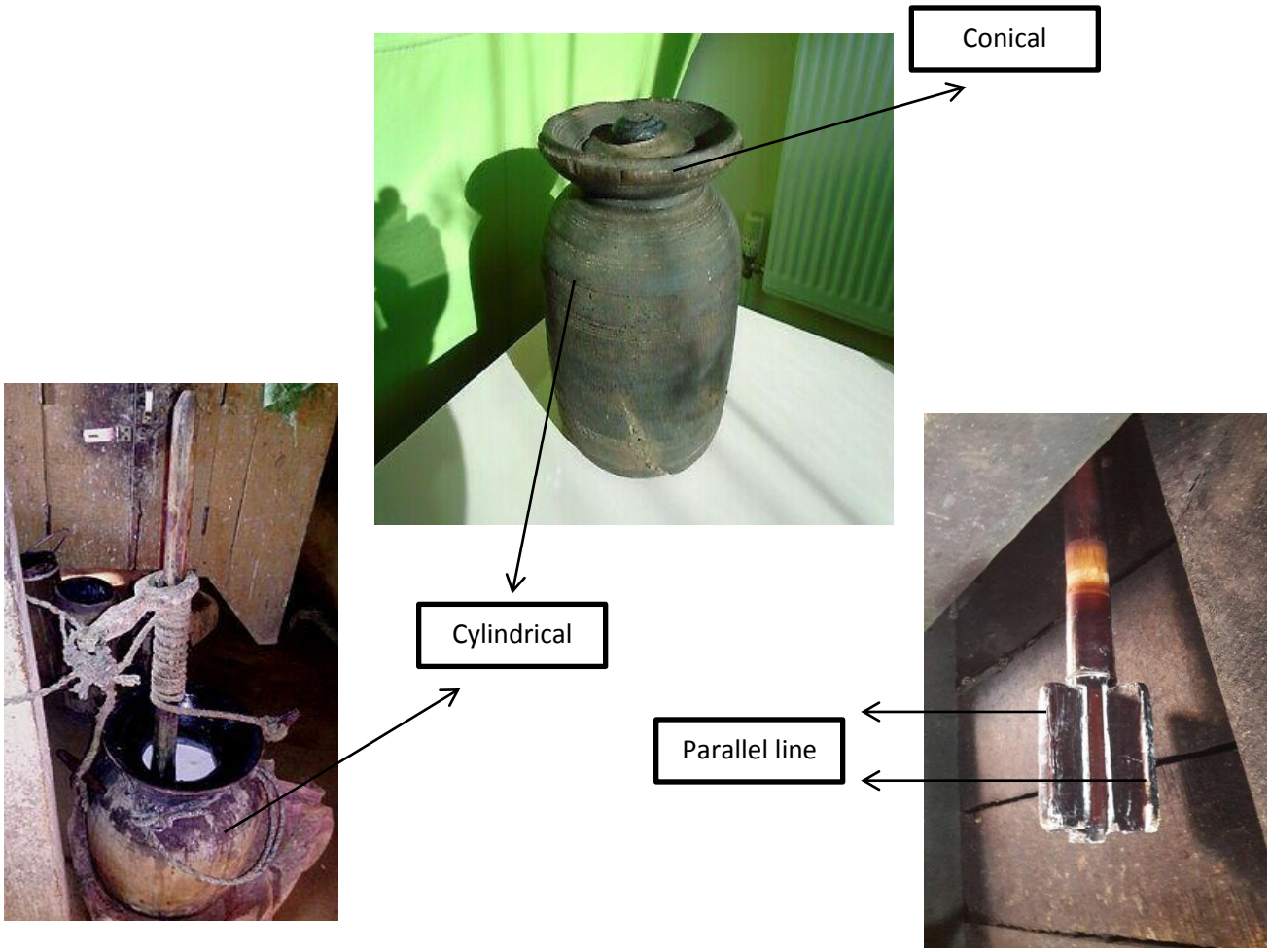
This is traditional good for using different purpose of human life. It can be applied pedagogically in secondary level for teaching concept of length, breadth, height, cylinder, vertical and horizontal plane, side of triangle, parallel line, circular, radius, diameter, area of volume and so on because its make like as geometrical shape such as rectangular, cubical, truncated, triangle, and combined cubical.

Mathani and Ghumouwa (Theki and Madani)

Mathani is the biggest of all devices used in churning butter and is the basic foundational device used. Cylindrical in shape at the body, it has a narrow neck while the mouth is a spreading fan-like structure. It is most commonly made by wooden. It is usually used to store milk fat and make butter out of it which can later be cooked to make the clarified butter also known as ghee and also make buttered milk.

Pedagogical Implications

It can be used to teach mathematical concept of Cylindrical, Parallel line, Conical, Spiral and so on.



Mathani and Ghumouwa (Theki and Madani)

Some Mathematical Implications Goods

Goods	Process	Geometrical Shape	Involvement of mathematical concept and implication
Bhauki	Spiral Coil	Globular	Greatest width is at the middle and decrease uniformly, line edge, base, radius, surface area, volume, diameter, flat surface, tessellation, pattern, parallel line, triangular design.
Berhi	Coiling	Rectangular, cubical, truncated, triangle, combined cubical	Length, breadth, height, vertical and horizontal plane, side of triangle, parallel line, circle, circular, radius, diameter, area, volume
Daliyaa	Spiral Coil	Half globular	Greatest width is at the middle and decreases uniformly line, edge, base, radius, surface area, volume, diameter, and spiral.

Chapter V

FINDINGS, CONCLUSIONS AND IMPLICATIONS

Finding of the Study

From the analysis and interpretation of collected data, it is concluded that Maithili's people have their own mathematical activities which are practices in their culture and livelihood to solve their daily life problems. Different mathematical concepts reflect on their daily communication. This research based on ethno-mathematics approach. The main purpose of this research was to bring out the mathematical practices and their pedagogical implication on Maithili community.

On the basis of analysis and interpretation of data, the major findings of these studies were as follows:

- Maithili culture holds innumerable mathematical ideas in their daily life used in basket, wooden materials for agricultural. But children receive limited response to questions asked about mathematics they are less informed about the wider world of mathematics. They only see and non- cognitive way of practices.
- The concept of rectangular and squares shape is in common practice among the Maithili. The parallel line and triangular are also dealt. They assume triangular is auspicious.
- Maithili's have concept of constructing circular, globular, cuboids, truncated, frustum, cylindrical, parallelepiped and spherical object of facilitate the daily the daily life.
- The plastering framework or goods with a mixture of day, paddy, and husk and cow dung reduce the weight of the articles. There are large numbers of cow Berhies of different shapes and size i.e. rectangular, cubical, and truncated triangle for storing this product.

- They used different geometrical techniques and concepts to construct different object such as Daliya, Bhauki, Khatiya, Supa, Dagara, Chhitti, Dhakiya, Bena, kothhi, Berhi, etc. the shape of various like conical, circular, spherical, semi-circle, square, triangle, quadrilateral, pentagon, hexagon, rectangles, parallelogram etc. practiced by in Maithili community.
- Some Maithili peoples are not able to differentiate between the shapes of objects like conical, circular, spherical, semi-circle, square, triangle, quadrilateral, pentagon, hexagon etc. but they are able to make the materials in these shapes. This shows that some of older Maithili peoples have knowledge of different geometrical shapes but they cannot interlink it with the course geometry.
- The Maithili of Sarlahi of Lalbandi Municipality has their own system of mathematical concept and their geometrical knowledge. All these process were based on traditional practices.

Conclusion of the Study

In Nepal, there are various ethnic groups which have their own traditional mathematical ideas. From the study the researchers reached to the conclusion that the present study is concerned with the mathematical ideas, and geometrical knowledge of Maithili community. But some ethnic group's mathematical ideas have still remained undiscovered. They could do very simple mathematical tasks slowly with using methods and role of mathematics. Many household skills related to mathematics were learnt in the social context. To teach and study under formal education materials, the advance of geometry is also trying to apply to teach for pedagogical purpose.

From the finding above it is concluded that this study was conducted in Sarlahi districts over Maithili community. The Maithili people of these districts have their own mathematical practices system. This research study was focused on local mathematical knowledge of Maithili community and their day to day practices of mathematical activities that are deal with functional basis.

This study was mainly purpose to how can Maithili community practices be linked own cultural and ethno-mathematics for teaching learning mathematics. Nowadays, the concept of local knowledge implementation in school is government's major priority. So I think this study one way of providing is to introduce Maithili ethno mathematics is helpful for pedagogical implication on class of mathematics and linked teaching learning mathematics. And one this research needs the study of relation between ethno-mathematics concept and their pedagogical implication at modern mathematical ideas.

It is conclusion that Maithili's have been used circle from in Oven (Chulha), perpendicular, parallel from in Dhenki, rectangular, rhombus from Khatiya, cone from in Chhitti (Dhakiya), spherical from Daliya, household good etc. and Rectangular, cubical, truncated, triangle, combined cubical from Berhi. Therefore there should be opportunity to share the ethno-mathematics concept cannot be preserved in isolation of community. If they are isolated should meet the needs of nation. This research needs the relation between ethno-mathematical concept and their pedagogical implication at modern mathematical ideas.

Implication of the Study

This study was conducted taking short period of time. On the basis of the finding of this research the following suggestions have made for further research.

- This study was limited to Lalbandi Municipality of Sarlahi district. Maithili people settlements in different Municipality of Sarlahi district. They have different language, culture, and system than that of Sarlahi district especially related with Thethhi language. So the ethno- mathematics of Maithili can be studied in Sarlahi district.
- Similar study should be conducted on different fields such as house making, village planning and making cannel and household goods arrangements.
- It is interesting to replicate this type of study in different socio- cultural content of Maithili villagers.
- It is interesting to replicate this study in only one field of basketwork, dancing system, clay works and house painting for in depth mathematical formulization.
- This research would be helpful for the researcher to study about the other ethnic group.
- This study can be helpful for new researchers to review their literatures and gain information about the indigenous mathematical knowledge practiced in Maithili community.
- To provide feedback for policy maker and curriculum planners to consider ethno-mathematics in curriculum and text books.

Chapter V I

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Appendix I

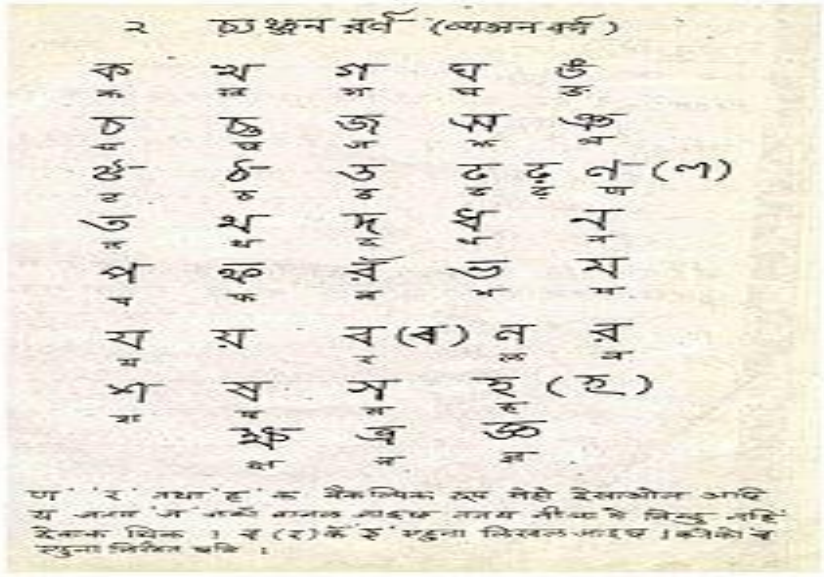
Some Language, Alphabet and Numerical of Maithili's Communities

Language:

S. No.	Maithili	Nepali
1	Daliya (Mujela)	Tokari
2	Jaata	Janto
3	Chatiyaa	Chattai
4	Birbaa	Berra
5	Birchhi	Birchhi
6	Dhekhi	Dhenki
7	Khatiya	Palang
8	Tayer	Bail Gada
9	Chhitti	Dhaki
10	Berhi (Kothhi)	Bhakari
11	Chhauki	Khat
12	Takwari	Suwa
13	Dagara (Supa)	Nanglo
14	Khar, Kar	-
15	Mathani and Ghumouwa	Theki and Madani

Alphabet and Numerical:

No.	Name	Maithili (Tirhuta)	Maithili (Devanagari)	Sanskrit	Days (Traditional Hindu sidereal solar calendar)
1	Baishakh	বৈসাখ	बैसाख	वैशाख	30 / 31
2	Jeth	জেঠ	जेठ	ज्येष्ठ	31 / 32
3	Asharh	আষাঢ়	आषाढ़	आषाढ	31 / 32
4	Saon	সাৱোন	सावोन	श्रावण	31 / 32
5	Bhado	ভাদো	भादो	भाद्रपद,भाद्र,प्रोष्ठपद	31 / 32
6	Aasin	আসিন	आसिन	आश्विन	31 / 30
7	Katik	কাতিক	कातिक	कार्तिक	29 / 30
8	Agahan	অগহন	अगहन	अग्रहायण,मार्गशीर्ष	29 / 30
9	Poos	পূস	पूस	पौष	29 / 30
10	Magh	মাঘ	माघ	माघ	29 / 30
11	Fagun	ফাগুন	फागुन	फाल्गुन	29 / 30
12	Chait	চৈতি	चैति	चैत्र	30 / 31



Source: Maithili Wikipedia

Appendix II

Photographs of Maithili's Practicing Tools

Maithili Men and Women

Tayergadha

Men making Chhitti

Men peeling Sugar-Cane

Daliya

Birbaa

Jataa

Women storing Paddy

Dagara

Women making Chatai

Dhekhi

Bhauki

Appendix III

Some Festivals of Maithili's Culture

Sama-Chakewa Parva, symbol of strong relationship: Sister and Brother.

Jitiya Parva, Special for Husband and Sons:Long-Lived.

Chhath Parva, Biggest Parv of Maithili's Community.

Appendix IV

Some Arts

Janaki-Temple: Architecture.

Painting of Maithili's Culture.

Source: Maithili Wikipedia

Appendix V

Name:

Age:

Gender: Male ☐ Female ☐

Interview Schedule for Maithili's Peoples

a) What kinds of domestic materials do you find in your house?
b) What is your occupation?
c) Which types of behaviour do you find among Maithili's people?
d) Which language do you use to learn mathematics?

Appendix VI

Interview Schedule

The observation for the research work entitled "Mathematical Practices in Maithili Community: An Ethnography Study".

Name: Address:

Sex: Occupation:

Age: Education Status:

Mathematical Concept:

a) How do you learn mathematical concept in your community?
b) How do you imply the geometrical concept in your community?
c) How do you construct geometrical figure for using your domestic instrument?

Mathematical Practicing:

a) How do you use your language in mathematical learning?
b) How many kinds of instruments we draw by geometrical concept?

Pedagogical Implication:

a) How do you geometric concept in teaching mathematics?
b) How do you find the mathematical idea about the construction of geometrical figures?
c) How do you measure the Khatiya, Har, Palo, Pirihaa?
d) How do you use the Chauki, Kothi, Chulhi, Birchhi etc. to imply in mathematics subject?

Appendix VII

Interview Formate for Villagers

Date of Interview:

Name: ……

Address: …….

Age: ……

Gender: ……..

Qualification: ……

Religion: ……

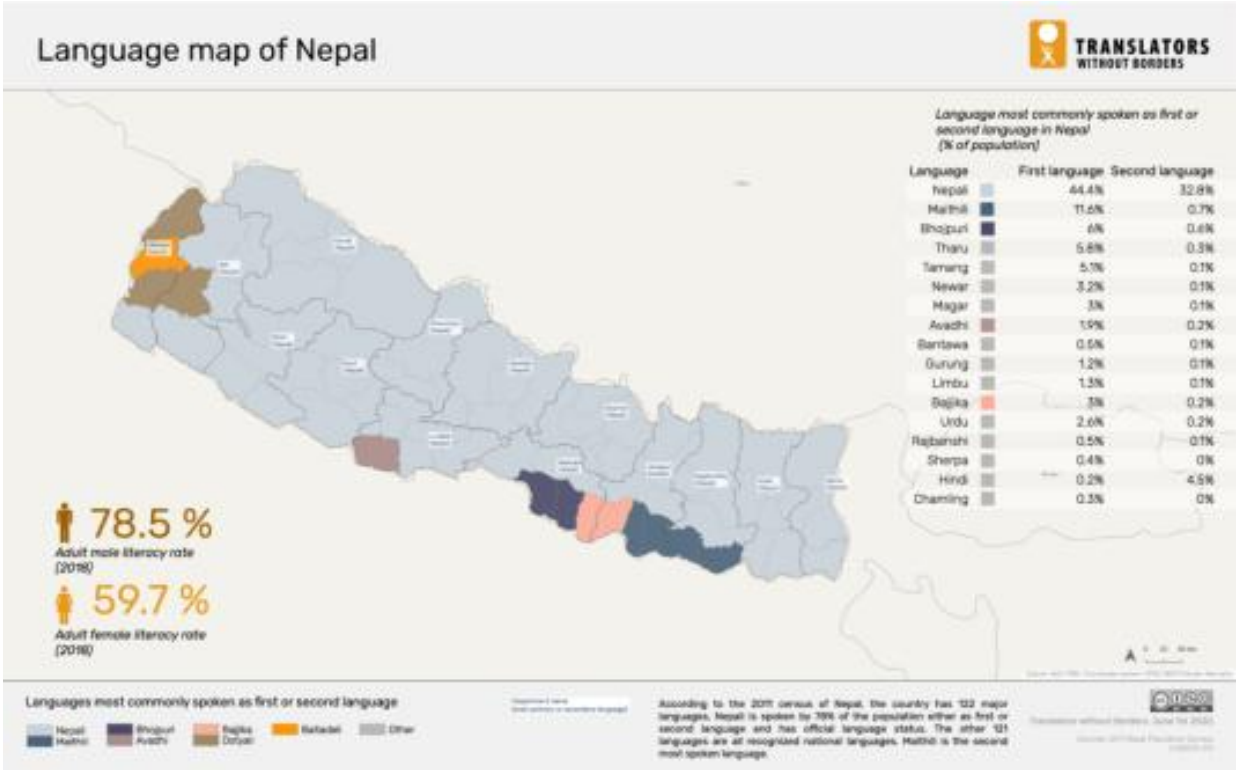
Occupation: ……..

The interview with the villagers were done on the basis of following topic:

- Idea about the handmade metarials.
- Use of mathematical concept on goods.
- Encouragement of childrens for mathematics learning using local language.
- Impact of cultural difference in the learning mathematics.
- Environment at home for learning to their childrens.

Appendix VIII

Map Showing Distribution of Ethnic Groups of Nepal



Source: Nepal Map Wikipedia