INTEGRATION OF ETHNOMATHEMATICS IN SECONDARY LEVEL: A SURVEY ONTEACHERS' PERCEPTIONS

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DECLARATION

To the best of my knowledge and belief, this thesis contains no material previously published by any other person except where due acknowledgement has been made. This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

_____ ……. 2019

Surendra Kumar Thakur

Degree Candidate

DEDICATION

This dissertation is dedicated to…

My parents whose inspiration, motivation, vision and belief guide me determine my journey of education. They always support me economically, socially, emotionally.

My brother Shailendra Kumar Thakur and my sister Amrita Kumari Thakur whose appearance fulfil my absence in my family during my educational journey.

Master of Educationin Mathematics Education dissertation of Surendra Kumar Thakur was presented on ….

Title: Integration of Ethnomathematics in Secondary Level: A Survey on Teachers' Perceptions

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ABSTRACT

An abstract of the dissertation of *Surendra Kumar Thakur* for the degree of *Master of Education in Mathematics Education* presented on ___, 2019 at School of Education, Kathmandu University.

Title: Integration of Ethnomathematics in Secondary Level: A Survey on Teachers' Perceptions

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The issue of ethnomathematics in academic research has gained its popularity worldwide. Moreover, the results of different research studies related to this area show that it is fruitful tool for mathematics teachers and educators for creating rich conceptual environment for students in learning mathematics. But a question arises here, are teachers aware of this issue? If yes, what are their perceptions on the integration of ethnomathematics?The main purpose of this study was to examine teachers' perceptions on the integration of ethnomathematics and subsequently teacher perceptions on the integration of ethnomathematics through sources (curriculum, textbook, classroom process and teacher learning) in secondary level. It also examined the relationships among curriculum, textbook, classroom process and teacher learning. Furthermore, this study was to examine significant difference among groups of independent variables regarding teachers' perceptions on the integration of ethnomathematics in secondary level.

This study employed a quantitative cross-sectional survey method that uses self-administered questionnaire to collect data from a sample with a target population of all mathematics teachers in all secondary level schools in Lalitpur district out of which 80 mathematics teachers in 42 secondary schools were sampled. The pilot test was conducted to

test internal consistency of self-administered questionnaire. It revealed strong internal consistency (i.e. 0.93). Descriptive and inferential statistics (parametric and non-parametric test) were used to test the hypothesis of the study.

The findings show that teachers' perceptions on the integration of ethnomathematics were at a moderate level (M = 3.37) and the same result also revealed on four sources of the integration of ethnomathematics namely; curriculum (M = 3.14), textbook (M = 3.23), classroom process (M = 3.60) and teacher learning (M = 3.52). Similarly, the study shows strong and positive relationship among the sources of integration except textbook and teacher learning (r = 0.46). Mann Whitney U test revealed that there was no significant difference between groups of gender, employment status regarding working time and teaching background. The same results also revealed independent sample t-test between groups of family occupation, academic qualification, employment status regarding job placement and schooling background. One-way ANOVA results show that there was no significant difference among the groups of teachers based on their teaching experience, training attendance and graduated faculty. But the results show that there was significant difference among the groups of teachers based on their age and post-hoc comparisons using the Tukey HSD test indicated that the mean score for " 40 above" group (M = 2.96, SD = 0.72) was significantly different from "20-30" group (M = 3.52, SD = 0.65) and "30-40" group (M = 3.48, SD = 0.53).

Therefore, based on the findings of this study, it can be concluded that the relationship among sources are strong and positive, however, the relationship between textbook and teacher learning is weak in comparison with others. Moreover, it can also be concluded that teachers' perceptions show positive relation regarding integration of ethnomathematics in secondary level. In the same way, the results also reveal that the integration of ethnomathematics takes place through the following sources such as curriculum, textbook,

classroom process and teacher learning. In terms of demographic independent variables, each group of each variable have positive perception on the integration of ethnomathematics in secondary level. Moreover, the study explored that there is significant difference about teachers' perceptions on the integration of ethnomathematics. Therefore, age group has a great impact on integration of ethnomathematics among all variables used in this study. Limitations of the study included the use of a convenience sampling, minor statistical assumptions violations, and questionnaire developed by the researcher for this research. In line with the findings of the study, the educational implications of the findings are highlighted in order to include cultural mathematical practices in school and the recommendations are equally proffered in favour of teachers to bring out students' indigenous mathematical practices.

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Surendra Kumar Thakur Date:

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ACRONYMS&ABBREVIATIONS

ANOVA–Analysis of Variance

APA–American Psychological Association

CDC–Curriculum Development Centre

CIA – Conventional Instructional Approach

EHRDC – Education and Human Resource Development Centre

EI – Emotional Intelligence

EIA – Ethnomathematics Instructional Approach

IBE – Intercultural Bilingual Education

ICT – Information Communication Technology

KU– Kathmandu University

KUSOED– Kathmandu University School of Education

MoE – Ministry of Education

MRT – Mental Rotation Task

NESP–National Education System Plan

PhD – Doctor of Philosophy

SD – Standard Deviation

SPSS – Statistical Package for Social Sciences

STE – Science, Technology and Engineering

UNESCO–United Nations Educational, Scientific and Cultural Organization

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CHAPTER I

INTRODUCTION

Chapter Overview

This chapter presents the overall structure of the dissertation. It begins with its introductory part highlighting the background of the study. This chapter also includes statement of the problem, purpose of the study, rationale of the study, research questions and hypothesesof the study.

Background of the Study

There is a long history of mathematical practices in different cultural groups consciously or unconsciously (Haryanto, Nusantara, Subanji,& Abadyo, 2016). Mathematics was started at the early age of human civilization to make their life and work systematic in order to balance social and daily life activitiesin a scientific manner and spread justice around their territory. In fact, the sound of justice itself is the culture of mathematical practice because it needs reasoning practices of each individual in theirculture, use of logic and previously defined rule by a cultural group, ethnicity, society, territory, etc. Moreover, gathering people in one place, distinguishing people by their occupation, language, dress, etc., are the fundamental concepts of academic mathematics like concept of counting, set, logic, etc. In order to develop the capability of people,peoplestarted to study complex combination of daily life activitiesof culture and culture groups in a formal way as concept of academic mathematics like logic, sets, function that are encompassed in single activity of culture at the same time. However, it was firstly introduced by D'Ambrosio as "*ethnomathematics*" in 1989 A.D., after a long time of human civilization.

Ethnomathematics may play a vital role to provide conceptual understanding of mathematical concept in school practice for higher academic achievement.Moreover, a teacher can provide students with a learning background that enables them to have a better social relationship with their everyday experiences. Likewise, they can also engage students in a culture and their context to search mathematics around them, context for better understanding of mathematics with rich connections among school mathematics and their experiences of mathematics outside school (Matang, 2002). Similarly, bringing diverse mathematical experiencesof culture in classroom mighthelp teachers to create multicultural mathematical environment for a supportive learning environment. Furthermore, it might help to know different perspectives of culture group about mathematics and discover common mathematical practices of different cultures within school torespect everyone's right to choose their ownwithout any discrimination.

In the context of Nepal,there is a huge possibility to unearth mathematical practices within cast, ethnicity, region, culture, occupation and food of different cultures, and toutilize them in mathematics classroom since it is a unique and rich country in terms of geography, society, culture, religion and language etc.(Curriculum Development Centre [CDC], 2007).Various research studies show that daily life practices of peoplehave rich mathematical practices in terms of those aspects that are interesting and useful for researchers and students too.For instance, mathematical practices of the Gurung Community like practices of number system, arithmetic operation, game and way of thinking are quite unique than that of our schooling system (Gurung, 2014). Likewise, the measurement system used by *Tharu* in *Chitwan* district and other types of mathematical practices are seen in this culture like numerical system and geometrical system (Poudel, 2008). In this way, other cultural mathematical practices are also being highlighted through different research studies in this area.

Statement of the Problem

Education is key to social and economic development(United Nations Educational, Scientific and Cultural Organization [UNESCO], 1948),the brain of any society and backbone of any system (Jha, Adhikary,& Pant, 2006) "that's general goal is the impartment, preservation, and renewal of a culture for those who belong to it" (Dijkstra, 2004, p. 148).Mathematics is taught and learnt as a compulsory subject at school level formal education all over the world and it has taken the same place in Nepal.The aims of mathematics teaching are to produce students who have ability to think critically, analyse and reflect in order to understand the mathematics around them, be creative and innovative and who have the knowledge and skills in mathematics based on scientific attitudes and values (CDC, 2007). Applicationsof mathematics enable students for effective decision making in their life and to solve the problems arisen in their real-life situations more effectively(Johari Surif, Nor Hasniza Ibrahim,& Mahani Mokhtar, 2012). Moreover, "mathematical knowledge and ability give people the power to function as critically thinking productive intellectuals capable of liberating themselves and their communities" (Rogers, 2017, p. 16). Likewise, mathematical knowledgealso prepares them to enter the higher level of education in their desired field such asadvance mathematics, technology, social science, natural science and other advanced field (Altay, Yalvaç, & Yeltekin, 2017)in order to discover some unique elements in the respective field.

But the contrast comes when we hear that mathematics is totally separated from our culture and context (Gurung, 2014), which demands more practice to master in mathematical concept through action of sequences for solving problems (Rimle-Johnson &Alibali, 1999),and emphasizes on by inborn intelligence for better performance in mathematics (Rogers, 2017). In this way, perhaps the most applicable subject in our everyday life and part of education for making global citizen, has become complicated, dead and foreign subject for

majority of learners (Luitel, 2009, p.3) and these beliefs about mathematics help to mislead real life connection of mathematics. However,mathematics is still popular among people due to its indispensable application in daily life activities in this technological world (Lamichhane & Belbase, 2017; Altay et al., 2017).Therefore, the stakeholders (teachers, researchers, government, etc.) are trying to make the positivemindset of students toward mathematics learningthrough different available tools. In such context, teachingmathematics through ethnomathematics approach in classroom may bea crucial way to enhance the conceptual understanding of students and improve students' achievement in mathematics using students' own mathematical ongoing practice (Nkopodi & Mosimege, 2009; Pradhan, 2018; Fouze & Amit 2018) because it has carried the importance of cultures to utilize the diversities of students in classroom discourse and their 'indigenous' daily life practices (Nkopodi & Mosimege, 2009).Moreover, the role of teacher should be capable of inducing students to utilize them or take the benefit from the ethnomathematics approach.

Nevertheless, dealing with the existing cultural diversityis still a challenge for teachers in the classroom (Bishop, 2002; François, 2009) because teachers may not be aware of how to utilize cultural diversity of classroom asopportunities for creating rich learning environment or the connection between mathematics and its application in their daily life may not be visualized through students' cultural examples, and mathematical works in their everyday life's activities (François, 2009).Therefore, this may be a reason to leaddecreasing interest towards learning mathematics and the achievement of students in mathematics day by day. In such a context, mathematics teachers must be aware ofethnomathematics to enable students to interrelate mathematical abilities to solve their daily life activities/problems (Rosa, 2000) and integrate those ethnomathematical ideasfor effective classroom teaching. The above discussion raises questions about teachers:"are teachers aware of theintegration of ethnomathematics in secondary level?". If yes, then what are their perceptions on the

integration of ethnomathematics?, and what are the factors that help them to perceive the integration of ethnomathematics that way? These are the central problems of this study that encouraged the researcher to conduct a research about teachers' perceptions on the integration of ethnomathematics in secondary level schooling in Lalitpur.

Purpose of the Study

The purpose of this study wasto examine the relationship amongfour sources i.e. curriculum, textbook, classroom process and teacher learningon the topic of teachers' perceptions on the integration of ethnomathematics in secondary level. Moreover, the purpose of this study was also to examine teachers'perceptions onthe integration of ethnomathematicsin secondary level, and their perceptions on the integration of ethnomathematicsthrough four sources such as curriculum, textbook, classroom process and teacher learningin secondary level.Furthermore, the purpose of this study was to examine the significant difference regarding their demographic factorsof their perceptions on the integration of ethnomathematics in secondary level.

Rationale of the Study

The knowledge and use of ethnomathematics is extremely important in today's classroom to ensure students' better understanding and qualitative achievement at school level mathematics learning.Therefore, this approach helps to achieve such objectives in the context of Nepal because ofdiverse culture which makes mathematics as the most applicable subject through different unique mathematical diversities embedded in cast, ethnicity, region, culture, occupation, food etc. But only identifying mathematics in such tools seems insufficient to utilize these mathematical practices in the classroom. For this, stakeholders, most specifically the teachers must be aware of it andthey should perceive the integration of ethnomathematics as useful for mathematics teaching and learning because they areconsidered as change agents in schooling system who shape vision of education (Pant,

2015). Therefore, the role of teacher is considered critical in meeting successful integration of ethnomathematics in the classroom.So, in order to bridge the gap, this research may play a vital role to aware teachers formally about the integration of ethnomathematics to enhance the learners' achievement in mathematics because if we can ensure teachers' perceptions onthe integration of ethnomathematicsin school, then it would be better for all stakeholders to include such practices in schooling system. They may also support teachers to utilize diverse mathematical science of their territorial cultural heritage in order to create rich mathematical context in mathematical classroom.If teachers' perceptions are seen to have a positive effect, then schools and the concerned agencies can use this data to support additional teacher development program for teachers regarding the integration of ethnomathematics in classroom for effective mathematics teaching. If no effect or a negative effect is found, then schools and school system may need to provide additional support to use training, allocation of resources for training aboutuse of ethnomathematics and its effective integration for teaching and learning.Moreover, the results of teachers' perceptions may be used to improve professional development practices in other districts of Nepal or in similar international contexts as well.

Research Questions

In this study, the following primary research questions served to guide the study.

Research Question 1: What are the relationships among sources such as curriculum, textbook, classroom process and teacher learning regarding teachers' perceptions on the integration of ethnomathematics?

Research Question 2: What arethe teachers'perceptions onthe integration of ethnomathematics in secondary level?

Research Question 3: What are the teachers' perceptions on the integration of ethnomathematics regarding different sources such as curriculum, textbook, classroom process and teacher learning?

Research Question 4: What are the demographic factors that contribute to secondary level mathematics teachers'perceptionson the integration of ethnomathematics?

Research Hypotheses

In order to examine above mentioned four research questions, the followingtwenty-threenull hypotheses were tested.

Hypotheses of Research Question One

Null Hypothesis 1. There is no relationship between curriculum and textbook regarding teachers' perceptions on the integration of ethnomathematics in secondary level.

Null Hypothesis 2. There is no relationship between curriculum and classroom process regarding teachers' perceptions on the integration of ethnomathematics in secondary level.

Null Hypothesis 3. There is no relationship between curriculum and teacher learningregarding teachers' perceptions on the integration of ethnomathematics in secondary level.

Null Hypothesis 4. There is no relationship between textbook and classroom process regarding teachers' perceptions on the integration of ethnomathematics in secondary level.

Null Hypothesis 5. There is no relationship between textbook and teacher learning regarding teachers' perceptions on the integration of ethnomathematics in secondary level.

Null Hypothesis 6. There is no relationship between classroom process and teacher learning regarding teachers' perceptions on the integration of ethnomathematics in secondary level.

Hypothesis of Research Question Two

Null Hypothesis 7. There isneutral perception of mathematics teacherson the integration of ethnomathematics in secondary level.

Hypotheses of Research Question Three

Null Hypothesis 8. There isneutral perception of mathematics teachers on the integration of ethnomathematics in secondary level through curriculum.

Null Hypothesis 9. There is neutral perception of mathematics teachers on the integration of ethnomathematics in secondary level through textbook.

Null Hypothesis 10. There is neutral perception of mathematics teacherson the integration of ethnomathematics in secondary level through classroom process.

Null Hypothesis 11. There is neutral perception of mathematics teachers on the integration of ethnomathematics in secondary level through teacher learning.

Hypotheses of Research Question Four

Null Hypothesis 12. There is no significant difference between genderofthe teachers'perceptionson the integration of ethnomathematics.

Null Hypothesis 13. There is no significant differencebetween working status of the teachers and their perceptions on the integration of ethnomathematics.

Null Hypothesis 14. There is no significant difference betweenteaching background of the teachers and their perceptions on the integration of ethnomathematics.

Null Hypothesis 15. There is no significant difference between the family occupation (agriculture and non-agriculture) of the teachers and theirperceptions on the integration of ethnomathematics.

Null Hypothesis 16. There is no significant differencebetween the academic qualification of the teachers and their perceptions on the integration of ethnomathematics.

Null Hypothesis 17. There is no significant difference between job placement (permanent and temporary) of the teachers and their perceptions on the integration to ethnomathematics.

Null Hypothesis 18. There is no significant difference ofthe teachers' perceptions on the integration of ethnomathematics due to schooling background.

Null Hypothesis19. There is no significant difference regarding the teacher perceptions on the integration of ethnomathematics due to age of teacher.

Null Hypothesis 20. There is no significant difference of the teachers' perceptionsthe integration of ethnomathematics due to experience level.

Null Hypothesis 21. There is no significant difference among the groups of training attendance ofthe teachers' perceptions on the integration of ethnomathematics.

Null Hypothesis 22. There is no significant difference among the group of graduation faculty of the teachers and their perceptions on theintegration of ethnomathematics.

Null Hypothesis 23. There is no significant difference among the religion groups of the teachers and their perceptions on the integration of ethnomathematics.

CHAPTER II

REVIEW OF LITERATURE

Chapter Overview

This chapter describes basically four main partssuch as thematic review, theoretical review, empirical review and the conceptual framework for this study. More concisely,thematic reviewpresents themes of this study and builds the subthemesto provide clarityrelating to various aspects linked with mathematics teachers' perceptions and the integration of ethnomathematics in secondary level. Moreover, theoretical research presents theoreticalbase on the problem. Likewise, empirical research is conducted to support this study through different empirical studies those are obtained by actual experience or by field experiment, direct or indirect observation in progress of time. Furthermore, the conceptual framework is presented in both ways such as narrative and diagrammatic to present the conceptual background for this study.

Thematic Review

Teachers' Perceptions

Teachers' perception is the representation of what is observed by teachers' awareness of something through their senses. Perception plays a vital role to lead a teacher for educational change such as decision making, and action taking in their daily life activities about teaching and learning (Thijs &Akker, 2009) becauseteachers' practice is overstated with their belief and knowledge (Thampson, 1992)to organize teaching and learning activities in the classroom. Therefore, it plays a key role to integrate ethnomathematics in schooling system for effective teaching.Furthermore, their perceptions enable them to understand young

people and the resources which they bring in relation to the contexts of classrooms and communities, the structures of schooling, and the content of mathematics.

Moreover, teachers' positive perceptions support teachersto respect students' personal belief, socio-cultural activities, ethical and cultural values in the classroom from their sense to organize, interpret and evaluate in order to reveal a meaning of concepts for reshaping the classroom environment (Robbins, 2003). It also enables them to construct a new sensory information and reinforce those views which are in favour of their sensory information about rich teaching and learning atmosphere in the classroom context.

In the context of formal education, teacher is considered as key factors for school's educational success (Hung & Li, 2017), making students responsible for their own learning through different approaches (Osmanoglu & Dincer, 2018) and bringing change and innovation in educational practices for making daily life activities meaningful for real life context (Bakkenes, Vermunt,& Wubbels, 2009). Therefore, teachers' perceptions help teacher to see the occurrence of ethnomathematics and its integration in secondary level.

Furthermore, a teacher spends most of the time with his/her students for their overall development such as mental, physical, socio-cultural, emotional, etc. Moreover, he/she also equally encourages students to adapt the new and changing world and to secure their position in accordance with the changing time and society. Due to differential factors such as their experiences, feelings, imagination power, value, norms, memories, beliefs and culture setting, "every individual may produce different perceptions than another individual toward a single object" (Tania, Liano,& Maru, 2016, p.30). Therefore, teachers may have different perceptions on the integration of ethnomathematics in secondary level that is crucial to utilize ethnomathematics as effective pedagogy for teaching and learning mathematics.

Ethnomathematics

Ethnomathematics was defined as mathematics of ethno where the prefix ethno refers to "cultural identity of a group such as language, codes, values, jargon, beliefs, food and dress, habits, and physical traits" in premature stage (Rosa & Orey, 2013, p. 62) but its shifted meaning refers to "an ethnical group, a national group, a racial group, a professional group, a group with a philosophical or ideological basis, a socio-cultural group and a group that is based on gender or sexual identity" (Powell, as cited in François, 2009, p. 1517); and mathematics refers to mathematical activities of "*ethno*". It is the daily activities of individual's work with number, shape and numerical calculation by human to solve various problems of everyday life that exist in all areas of life like "observing, representing and investigating patterns and quantitative relationships in physical and social phenomena and between mathematical objects themselves" (Barnes, 2005, p, 42) and "[the] way of thinking, with its concepts" (Umay, as cited in Altay et al., 2017, p. 158) in order to solve such problems.

Taking wider meaning of ethno and mathematics into an account, ethnomathematics is not limited to its traditional definitions only as the mathematics generated by culture for surviving and making their daily activities systematic beyond the academic mathematical procedure (D'Ambrosio, 1989). However, it is now defined as the activities of group of individuals having common concerns, family, society, and nation and eventually of the whole world as ethnomathematics. In addition, the practices of racial, sexual and intellectual groups of individuals trying to cope with their daily life problems that are arisen in their activities are also the concerns of ethnomathematics at present.

According to D'Ambrosio (1989), ethnomathematics is the mathematical practice of culture group or mathematical practices of a group of people who share common interests, ideas, and ways of communicating with one another. Moreover, it is the special way of doing mathematical practices within their culture and their activities. We believe that each culture

group has its own “mathematical opinion in written or verbal form” (Fouze & Amrit, 2018) to guide the culture and use such mathematical form to make close relationship with their people for other cultural practices in particular situation and under terms and conditions. They teach those mathematical activities to their people who belong to their culture group and they forward those practices to next generation.

Integration of Ethnomathematics in Schooling System

Integration of ethnomathematics is continuous process in order to fulfil various needs of people such as personal, social, emotional, educational, etc. It started to evolve at early age of human civilization and got integrated in schooling system across periods and cultures (Stedall, 2012)because we know that human civilization is being merged for various purposes such as for better employment opportunities, higher education and settlement. In this process, their culture, tradition, practice and other indigenous practices within their culture are also shifted along with them. They adapt to new local practice of new cultural group and share their indigenous practices with them. Most of mathematical practices of different cultural groups are being merged within a particular placefrom one person to another, from one culture to another, with specific interpretation within their own context (Stedall, 2012).Similarly, “ethnomathematics is integrated in [schooling system through various sources such as] technological, industrial, military, economic, political systems, etc.,”(Fouze & Amrit, 2018, p. 619) but curriculum, textbooks, classroom process and teacher learning are direct sources of integration of ethnomathematicsbecause these sources play a significant role to collaborate teachers and students for better achievement.For example, curriculum is developed by educationalists taking the interest and ideologies of particular people, culture and society (Howson, Keitel,& Kilpatrick, 2008). Likewise, textbooks contain relevant examples, illustrations and problems arisen in the context(Johansson, 2003).Moreover, teacher’s personal and professional experience help them for the pedagogical decision

inclassroom process (Kitchen, 2009). Therefore, both sources such as teacher learning and classroom process are vital sources of integration of ethnomathematics in schooling system.

Curriculum.Curriculum is influenced by the history and culture of people and is developed in the presence of many stakeholders such as politicians, educational administrators, teachers, publishers, educational researchers, students, parents, employers and taxpayers with their personal and social ideologies and interests (Howson et al., 2008, p.7)"to meet the needs and current demand of the cultureand the society"(Alsubaie, 2016, p. 106). Therefore, they integrate relevant contents and the applications of mathematics for their culture and context to serve the variety of causes such as political, religious, educational, social background, etc. during curriculum making process in order to address recent issues in mathematics teaching (Matang, 2002). Moreover, curriculum is developed based on constructivist approach (Duman & Aslan, 2019) that integrate the cultural aspects in contents of study, materials, methods and process of evaluation of a course toachieve goals, general objectives, specific objectives andaim of education (Ministry of Education [MoE], 2028).Therefore, curriculum is the source of the integration of ethnomathematics in schooling process.

Textbook. Textbook is prepared to help teacher and learners to learncomplete contents of a course in details with specific manner (Duman & Aslan, 2019). It provides specific details about mathematical concepts and related matters such as definition, formula, example in relation to the context, relevant illustration of concepts and exercises for developing competencies in those concepts (Johansson, 2003).Textbook is developed based on constructivist approach (Duman & Aslan, 2019) to conform actual situation and need of country (MoE, 2028). Therefore, several examples of concepts, questions, set of rules andreal-life images such as photographs, to represent the problem situation, are being merged

in schooling system for making mathematics more useful and relevant through contextual examples. Because of that textbook is also a great source of integration of ethnomathematics.

Classroom processes. Classroom is a part of community with defined cultural practiceswhereall students bring their cultureas resources (Adam, 2004)toacquire conceptual understandingof abstract mathematical concepts (Matang, 2002, p. 35). They use one another's cultural ideas as resources for building collective knowledge and capability in relation to specific instructional goals, (the cope with real life problems, perform well, etc.) because “mathematics is a part of students' social and cultural lives and the social and cultural is a part of their experience in the mathematics classroom” (Boaler, 1993, p. 346). In such way, ethnomathematics is integrated in schooling system through classroom process.

Teacher learning. Learning is a continuous and essential process for teachers to gain useful and wide range of experiences for teaching career (Eryılmaz & Aypay, 2016) because teacher learning imposes teachers to include social and cultures’ mathematical reality of the students through examples, concepts, etc. Moreover, the integration of ethnomathematics can be seen in teacher’s content knowledge, way of teaching and teaching methods in order to make effective decisions to cope with problem related to their profession and to accept responsibility for them (Howson et al., 2008, p.7). Moreover, it helps them to create rich classroom leaning environment to enhance students’ achievement, and to provide better conceptual understanding about concepts and contents.Therefore, it is also significant source of integration of ethnomathematics in school level.

Multicultural Mathematics in Formal Education

Multicultural mathematics is a view of mathematics that enables us to see mathematics as the integrated form of ethnomathematics of diverse culture groups such as interests, learning styles, and achievement levels of students to work together (Zaslavsky, 1998).According to Waller and Flood (2016), “multicultural mathematics allows connections

to be made between mathematics and the real world"(p. 302) that encourages teachersto participate their students in sense making discourses.This view also enables teachers to select tasks or problems that are rich contexts for engaging students in learning process and promotes right based education for all students to achieve basic competencies that lead them towards a modern world.

Theoretical Review

The study concerns with teachers' perceptions and the integration of ethnomathematics so the researcher explored that the ethnomathematics and multicultural modelling in mathematics as educational perspectives are appropriate for this research study.

Ethnomathematics as an Educational Perspective

Ethnomathematics as an educational perspective provides a space for culturally rich mathematical activities in schooling system to teach mathematics through available cultural tools such as codes, values, conducts, and practices to serve their natural interest within mathematics classroom for reforming educational setting (Rosa & Orey, 2013). From this perspective,most of applicable cultural mathematics can be retrieved in order to shape the classroom environment with underlying meaning of mathematics in culture (Boaler, 1993).Moreover, it leads learners to probe in-depth study aboutmathematical practice within their culture (Kathmandu University School of Education [KUSOED], 2008) and reconstruct their cultural mathematics logically in order to link to contextual human activities (Rosa& Orey, 2018).

This postmodern perspective allows us to see academic mathematics with the lens of ethnomathematicsand search for grounded significance of school mathematics in culturaldiversityto understand real life activities of people (Waller&Flood, 2016). This perspective offers rich possibilities to reinforce the quality of mathematics education and

engage teachers, students and parents to search for contextual mathematical examples to visualize school mathematical content (KUSOED, 2008).

Multicultural Modelling in Mathematics as Educational Approach

Multicultural modellingapproach in mathematics is indispensable approach to organize mathematical knowledge of multicultural groups embedded in their tools such as code, dress, language, ethnicity, festival and daily life activities, etc. This approach helps toreorganize the mathematical knowledge of multicultural effectively to facet the academic problems related to teaching and learning mathematics (Nkopodi & Mosimege, 2009). Therefore, this approach makes mathematics concrete andestablishes the connection between mathematics and their culture because this approach enables learners to see mathematical relevance in their culture, and assist them in learning academic mathematics(Rosa & Orey, 2013).

Multicultural modelling in mathematics allows us to see cultural diversity in classroom as opportunity. This approach helps to create rich cultural environment in classroom from strength of such different diversities to understand the purpose of such mathematical activities.So, this approach helps to reshape structure of mathematics within social and national environment as well reconstruct the varieties of activities of culture to meet the standard of society in the present context to achieve shared goal of society, nation and the world.The lens of multicultural mathematics helps to see schooling system as a place of learners for diverse cultural groups to make their lifestyle better with their own common practices and liberate himself/herself and their people from cultural isolation.

Empirical Review

In the empirical review, the researcher has tried to present the overall review of empirical research studies related to the research area mainlyteachers' perceptions on the integration of ethnomathematics.

A qualitative research was conducted by Nkopodi and Mosimege (2009) to obtain an underpinning thought of learners about their familiar and indigenous game of *morabaraba* in relation with mathematical concepts. They found various mathematical concepts in that gamethat can be used to promote mathematics teaching in multicultural setting through indigenous game in their classroom and make mathematics learning process more enjoyable beyond specific culture group. In addition, teachers can usethe game to provide spontaneous interaction amongst learners through their individual, social activities and experience in their circle group.The study basically focused on mathematical concepts in particular game of specific culture. The study provided great breakthrough for teaching and learning process. However, the study was oriented toward a single gameand could not study about mathematical practices in other games, what perceptions teacherspossess about mathematics in that game and, in other cultural activities.

A study by Küçük (2013), is a remarkable and reasonably purposeful for geometry teaching in Anatolian culture by using their geometry perception in carpet and rug motifs in terms of ethnomathematics. In this study, he explored that ethnomathematics plays a significant role to interrelate mathematics education and historical culture field. The study also revealed that Anatolian people have encompassed the use of mathematical concepts in their lifestyles to decorate their houses and building. Moreover, the motifs in the rugs and carpets can be taken as example of the reflections of mathematical thoughts in the minds of Anatolian people. The findings of the study also revealed that there are many applications of their ethnomathematical practices in mathematics education. Therefore, a teacher can use toteach the notion of school mathematics through students' own mathematics practice as real applications of mathematics within their circumstances and provide skill of mathematization of any kinds of future situations. Furthermore, such ethnomathematics can be used to encourage students and realize about mathematical practices in their social activities and their

cultural practices. However, this study could not include other areas of mathematics i.e. algebra, arithmetic, statistics, etc. of that culture. Moreover, this study could not study the perceptions of teachers about such mathematics and how such geometrical concepts can be integrated in classroom teaching.

A quasi-experimental research was conducted by Ogunkunle and George (2015), which incorporated two experimental groups and one control group was presented to investigate the effects of integrating ethnomathematics into secondary school mathematics curriculum for effective artisan creative skill development in Abia State, Nigeria. 117 samples were randomly selected out of 407 Junior Secondary school students by taking two students in all the public junior secondary schools in Isiala Ngwa North Local Government Area. In two experimental groups, they had integrated ethnomathematics approach into the conventional teaching approach via demonstration and discussion to teach raffia weaving and pottery to group first and second respectively. This study showed that students taught by integrating ethnomathematics instructional approach via practical had the greatest mean gain in the acquisition of creative skills. Moreover, they found a significant difference in the creative skills acquired by students for artisan skills development while taught using EIA and CIA. Therefore, they recommended others especially, mathematics teachersto integrate ethnomathematics instructional approach to develop artisan creative skill of students and to improve artisan creative skills through students' ethnomathematical practice in classroom teaching.However, this study did not cover teachers' perceptions about such integrations and how it could be integrated in classroom teaching.

The research conducted by Haryanto et al. (2016) showed that Arfak tribal communities are using concept of triangle to bin the piles of house "*Rumah Kaki Seribu*". In this research, they have used exploration, documentation, interview, experiments and literature studies method. They focused on the models of knot that is used in the frame of

Rumah Kaki Seribu through the geometrical concepts such as triangle, transformation, angles, line, distance, etc. Therefore, the knot modelwas studied mathematically. The results of this study revealed the way Arfak tribal communities think mathematically and use the characteristics of a triangle in knot model. It can be proved by looking at their consideration of the strengths, endurance, and the stability of their Rumah Kaki Seribu.Therefore, this study provided considerable evidence that ethnomathematics of culture can be used to teach them academic mathematics. However, this study could not examine teachers' perceptions and could not suggest how it could be integrated in school mathematics.

A descriptive survey research was conducted by Aikpitanyi and Eraikhuemen (2017) to investigate mathematics teachers' use of ethnomathematics approach in mathematics teaching. Ethnomathematics opinion survey questionnaire was used to collect data from 121 randomly selected mathematics teachers of fourteen public secondary schools from each three local government areas by balloting.The result of descriptive statistics showed that majority of mathematics teachers used ethnomathematics in their teaching. It also revealed that there is no significant difference between male mathematics teachers and their female counterparts as well as rural areas and their counterparts in urban areas in their use of ethnomathematics approach to teaching. This study also made several recommendations for effective mathematics teaching. One of them is related to national policy on education and it recommended that the ratio of teachersand students to be 1:40 in classroom for effective use of ethnomathematics.However, this research study could not explore how they are integrated in classroom and how much effective ethnomathematics is for mathematics teaching in schooling system.

An exploratory research study was conducted by Abdullah (2017)to find and know about a phenomenon by using ethnographic approach in study. An empirical and theoretical approach was used to get description and deep analysis about culture based on the field study.

It is found that ethnomathematics is still widely used by Sundanese people, especially in rural areas: the use of measurement units, mathematical modelling, and the use of clock symbols from the sustainable interviews and confirmation about field research with some community leaders in Cipatujah district, Tasikmalaya regency and Santolo Pameungpeuk beach, Garut regency. The results revealed that ethnomathematical practices Sundanese can be useful for people and the government of West Java to guide education, develop cultural services, and tourism. But this study did not incorporate such ethnomathematics noticed by teachers during teaching process and what type of policy required to integrate such types of ethnomathematical practices in schooling system.

Muhtadi, Sukirwan, Warsito, and Prahmana(2017) conducted an exploratory ethnographic studyto study mathematical activities of Sundanese related to three activities, namely estimating, measuring, and making patterns appearing in the activities in term of *kibik* (a unit for measuring volume), *bata* (a unit for measuring surface area), and path *pihuntuan* (a model of cane work). The study found that people are performing mathematical activities based on the values inherent in their everyday practical activities of Sundanese culture in Sundanese. For instance, measure is based on objects that are used, and the estimate is based on cultural activities carried out for generations. For the size of the basic concepts and activities, Sundanese culture apply mathematical concepts in a very strict manner. Two main conclusions can be learnt from this study to improve our education practices and; to improve culture false generalization through strong argument. For example, basic concepts of size and pattern *pihuntuan* (a model of cane work) in constructing certain geometric patterns to support first conclusion; and measuring the activity of mathematical rules can be taken to support second conclusion, and false generalization about application measuring.However, this study did not address why concepts are not used to teach mathematics in schooling

system and why the people made such type of false mathematical generalization in their culture.

A research conducted by Hartono and Saputro (2018) used qualitative approach, with descriptive method. In this research, they have used direct observation and communication techniques, namely interviews as instrument to collect information from Dayak Tabun community leaders, especially makers, users, and traditional stakeholders. The results of the research obtained in relation to various branches of mathematics such as arithmetic, algebra, geometry, trigonometry, etc.They were presented resultsto provide rich understanding such as form, learning context in geometric concepts, namely flat and wake up space; and aspects of the motive,the learning context in the geometry concepts such as two-dimensionallines, and angles, besides that the algebraic concept is a number pattern in the form of a constant sequence; and the way of making, the learning context in the algebraic concept of numbers, namely fractions in dividing the material into two parts, calculating operations, especially on natural numbers, sequential numbers through measurement of materials; and in terms of the use of tools, the context of calculating operating learning is the tool used in the dance, namely the tapping of movements and elevation angles in trigonometric material, namely the use of a Sangkuh Akai tool.However, the study did not explore how to bring such mathematical practices in schooling system and how teachers can helpto use them in the classroom for effective learning.

A project undertaken by UNESCO collaboration with KUSOED (2008) wasset up to develop culturally contextualised mathematics curriculum resource materials for women and economically disadvantaged ethnic communities –*Tamang* and *Gopali* – of the hilly regions of Nepal in accordance with their socio-cultural practices.The objective of this study was tohelp teachers to develop mathematical knowledge, teaching material and resources, curriculum and teaching pedagogy in accordance with daily life cultural practices of students

for their active participation in mathematics classroom.This action research study haschanged the mindset of teachers, motivated students, raised awareness of parents, and confirmed the need of contextualized curricular materials. However, this study did not address what types of difficulties have arisento collect and develop culturally based teaching resources and materials. Moreover, this study did not address what types of responses came from other groups regarding teaching resources.

Poudel (2008) in an ethnographic study focused on different cultural activities of the *Tharu* community of *Chitwan* district related to the measurement system, numerical system and geometrical system, in which, he concluded that ethnomathematics and culture are interlinked. Moreover, the perceptions of mathematics persevered by Tharu community differ from school mathematics but he found the practice of measurement system similar to modern and traditional practice.However, this study did not explore why people have practised similar measurement system in their culture. This study also could not address other branches of mathematics such as trigonometry, transformation, logic, statistics, etc.

Gurung (2014) in a study concluded that there are various mathematical practices in culture of Gurung community, in which, the practices of number system, arithmetic operation, game and way of thinking werequite unique than our schooling system. But this study did not inform these mathematical practices ever discussed by teacher in classroom during teaching. In same way, she did not discusshow such mathematical practices of culture can be brought in schooling process.

Two ethnographic studies of Pradhan (2018 and 2019) mentioned about "*Chungi*" and "*Bagha Chal* (tiger move)" games to search for the possibility of cultural game in fostering students' abilitiesand to create strong association between mathematics and students' mathematical knowledge hidden in recreation, enjoyment and pastimes. He has used observation and interview as tools in both research studies to collect information from

thecommunity school's mathematics teachers and students of Kathmandu district. The results of these studieshave shown that there are various types of mathematical ideas embedded in both games and playing processessuch as counting, grouping, comparing, and four fundamental operations of arithmetic. Moreover, algebraic and statistical concepts are also rooted in their playing activities. He concluded that cultural game as an effective tool to develop mathematical concepts because mathematical concept, rule and activities in cultural game and school mathematics pose similar characteristics.Therefore, it can be used to enhance students' understanding in student' friendly environment in classroom for better achievement in mathematics. However, these studies could not assess what should be role of teachers to connect mathematics and culture game in effective teaching process.

Gaps in the Literature

Ethnomathematicsis taking its shape in the field of mathematics education. Researchers are showing their interest to integrate ethnomathematics in the field of mathematics education, and are tryingto bring out those mathematical practices in schooling system toimprovestudents' achievement in mathematics. Moreover, they are putting their effort continuously to unearth mathematics in different culture, context and ethnicity which is embedded in the culture and hidden during long period and is being practiced in indigenous culture even it has not been noticed by group of people in a culture. Likewise, theymay not be able to show by direct connection between ethnomathematics and school mathematics to their child or group of people.To be aware of this issue, teacher should be responsible for this because he/she is considered as a key factor for school's educational success (Hung & Li, 2017), and to make students responsible about their own learning through different approaches (Osmanoglu & Dincer, 2018). Furthermore,the research in this area such as the integration of ethnomathematics, teacher perceptionsmay be more appropriate to apply this notion in school mathematics.

After analysing the literaturein the field of ethnomathematics, the study of ethnomathematicshas been taking place all over the world.For example, theresearch study conducted by Hartono and Saputro (2018) and by Haryanto et al. (2016) can be taken as examples. In the same way, it is a recent issue in the context of Nepal that has taken prestigious place in mathematics education. Several research studies can be found in ethnomathematics such that cultural artefacts, and cultural games (Pradhan, 2018; 2019) and the different cultures such as Tharu culture (Poudel, 2008) and Gurung culture (Gurung, 2014) can be taken as examples.

But it is hard to find out the research which has been carried out about teachers' perceptions on the integration of ethnomathematics. Therefore, the study about teachers'perceptions on the integration of ethnomathematics in secondary level is crucial to ensure better understanding and achievement because student's perception has been constructed from previous experiences with teachers about mathematics (Rogers, 2017). So, it is also important to know teachers' perceptions on the integration of ethnomathematics to make mathematics more contextual and, to include the examples of different notions of mathematics in classroom. This research concerns with mathematics teachers' perceptions on the integration of ethnomathematics which directly deals with ethnomathematics, itsintegration in secondary level and teachers'perceptions. This is still an under-researched so the researcher decided that a validated instrument was needed to measure it.This research has different context and more inclined to teachers' perceptions and the integration of ethnomathematics. In fact, what are the teachers' perceptions on the integration of ethnomathematics and what are the factors that affect teacher perceptions on the integration of ethnomathematics. Hence, this study will add a brick on the research in the field of ethnomathematics and it helps to bridge the gap regarding school and culture to use

ethnomathematics to improve school mathematics achievement of students.Therefore, the study of teachers' perceptions on the integration of ethnomathematics has been conducted.

Conceptual Framework

This study has its own conceptual frameworkbased on a synthesis of theintegration of ethnomathematicsin schooling system (see Figure 2.1). Going through available literature to far, the researcher found that ethnomathematics was not prioritized in schooling process by students, teachers and other stakeholders because of their unplumbed belief about mathematics as foreign subject (Shirley, 1995; Luitel &Taylor, 2005). Ethnomathematicshas been merged in schooling process at earlier agethrough some major sources of schooling process such as curriculum, textbook, classroom and teacher learning,etc.Furthermore, most of the research studiesconducted in the similar field strongly argue that thestudents' culture should be more flexible in such sources to make mathematics more relevant (Matang, 2002; Zhang & Zhang, 2010; Tun, 2016) in order to create culture oriented rich mathematical environment for contextual learning(KUSOED, 2008). Moreover, mathematical practice in cultureshould be used in schooling system as ethnomathematics as educational perspective to integrate more cultural mathematical practices to support teaching and learning academic mathematics for better understanding. In order to serve the aim, the integration of ethnomathematicscreates an overall view about mathematics as interrelation with multicultural aspects in school process to see "how it is produced, transferred, diffused and specialized in diverse cultural systems" (Zhang & Zhang, 2010, p. 152). Ethnomathematics as educational perspective helps to bring diverse culture in schooling process to unearth valuable mathematical practices of culturethrough multicultural modelling in mathematicsformal education as educational approach to respect such types of notionsagain and again (Gerdes, 1996).

Nevertheless, teachers' perceptions play a significant role in order to integrate such diverse and relevant cultural practices for their students in their classroom practices in cooperation with other teachers, parents, and the community schooling process (Zaslavsky, 1998, p. 503). Therefore,teachers' perceptions on such thingssuch as the integration of ethnomathematics, sources of its integration (curriculum, textbook, classroom process and teacher learning) and the relationship among such sources werestudied by using the survey method and survey questionnaire as tool. Moreover, teachers' demographic factorswere also examined to test significant differences regardingteachers' perceptions on the integration of ethnomathematics in secondary level. The synthesized framework is presented below.

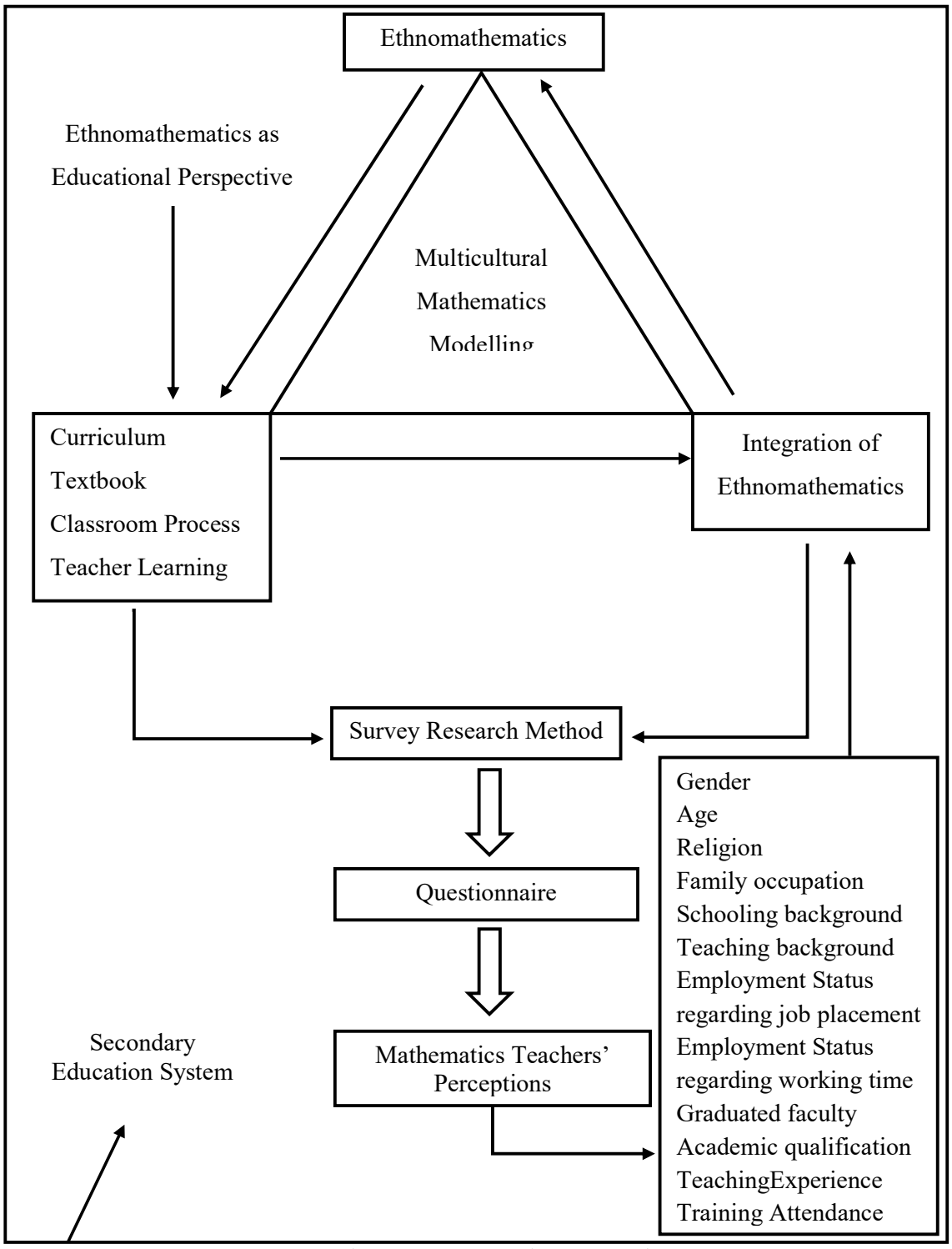


Figure*1*.Conceptual Framework

CHAPTER III

METHODOLOGY

Chapter Overview

This chapter covers philosophical and procedural considerations of this research, thereby including methodological considerations that influence the entire research design. Within this frame, the researcher has discussed population, sample and instrument of the study.Besides these, he has also discussed the process of data collection, analysis and interpretation. At the end this chapter, the researcher has concluded the chapter with ethical considerations.

Philosophical Considerations

Philosophical standpoint is crucial in selecting the appropriate research methodology and design. For this, the researcher must be aware of paradigm, ontology, epistemology and axiology. Moreover, he/she should inform reader about his/her philosophical viewpoint in the research. Therefore, the researcher has mentioned his philosophical standpoint in this study.

Paradigm is a general belief or world view that attaches the researcher with particular world view (Denzin & Lincoln, 2018) anddirectshim/her to see the object of researchthrough that view withina particular discipline. According to the nature of this study as discussed in the first chapter, the researcher focused on generalizable knowledge about teachers'perceptions on the integration of ethnomathematics because he knew that there exists generalizable truth about the integration of ethnomathematics.In order to serve the purpose, the researcher was guided by post-positivist paradigm because post-positivists also seek to search for objective and generalizable knowledge (Taylor & Medina, 2013). Moreover, the post-positivists believe that researchers can never represent that truth with

complete accuracy (Spencer, Pryce, & Walsh, 2015) due to different factors such as participants' bias, researchers' bias and method of study. Likewise, this research process was oriented toward objective reality of data than their subjective, which focused on post-positive paradigm (Taylor & Medina, 2013).

Ontology is theoretical existence of being and reality of the world which exists. It is concerned with the scientific study of our general beliefs and existence of knowledge in reality (Richards, 2003). According to the nature of the research, the researcher has tried to stand himself as post-positivist, which directs the ontological assumption of this research as singular reality rather than multiple one with relative truth about existing knowledge. It influences epistemological assumption as objective reality rather than subjective study of knowledge (Richards, 2003, p. 35) because knowledge can be perceived through objectivity. For instance, we can study the reality by using standard questionnaires.

In summary, philosophical ground in research is crucial part for researching process because it influences the methodology of study and provides a strong standpoint for the researcher to select instrumentation and data collection process in research with strong intellectual foundation. In this research, the researcher has tried to study about perceptions of mathematics teachers on the integration of ethnomathematics. In case of this research, the researcher believes that the knowledge about ethnomathematics and its integrations in school mathematics is standing on singular reality and can be understood objectively. The researcher has presented himself as the third person in this research to ensure axiology as value-freedom.

Research Design

The best research design is one that will add to knowledge, no matter what the results are.

-(Slavin, 1992, p. 3)

After theoretical discussions, it comes down to the practical aspect of the research. Philosophical ground helps the researcher to choose the best research design for any research (study) because “ontological assumptions give rise to epistemological assumptions; these in turn, give rise to methodological considerations; and these in turn, give rise to issues of instrumentation and data collection” (Hitchcock & Hughes as cited in Cohen, Manion,& Morrison, 2018, p. 3). Philosophical foundation such as; ontology, epistemology and axiology in philosophical considerations for this research are singular reality, objectivity and value-freedom respectively.

This study is concerned with research approach as quantitative, basically cross-sectional survey approach to study the teachers’ perceptions on the integration of ethnomathematics in secondary level through quantifiabledata because the survey methodhelps the researcher to collect data from a broad spectrum of individuals and educational settings through their responses to the questionnaires systematically in order to study people’s feeling and thinking about specific issues (Graziano & Raulin, 2000). Moreover, the fundamental aim of this research was to describe the features of the group with questionnaires regarding teachers’ perceptions on the integration of ethnomathematics to a large group of participants, and the fundamental aim of survey research coincides with the aim of the study, in comparison to other research design (Fraenkel & Wallen, 1996) that leads the researcher to choose the cross-sectional survey design as appropriate research design.

Cohen et al. (2018) stated that the design is governed by “fitness for purpose” (p. 173) because the researcher can find out what they want to find out from the research and the purpose of the research study was also to study general tendency of population through sample about the integration of ethnomathematics. More precisely, the purpose of this research was to determine secondary level mathematics teachers’perceptions on the integration of ethnomathematics in Lalitpur district and generalize the result on whole

population through sample (Hopkins, 2000) using statistical technologies(Charles, 1995).The expressed statistical results of the study were cornerstone to explain the opinion of sample and, to predict about population through sampled participants to be informed about an issue (Creswell, 2015).

Population of the Study

Population is any collection of specified group of human and non-human like as object, animal and plant etc.,having commoncharacteristics under the interest ofresearchersfor variousstatistical and non-statistical investigations. According to Best and Kahn (2006), "population is defined as a group of individuals with at least one common characteristic that distinguishes that group from other individual or groups" (p. 13). In the context of this research, the underlying objective of this research was to find out teachers'perceptions onthe integration of ethnomathematics. So, the secondary level mathematics teachers of Lalitpur district were considered as the population of this research study. It was hard to find out the authentic and systematic list of secondary level mathematics teacher of Lalitpur district. Therefore,the researcher took secondary level schools as basis to estimate the population of the study (Fowler, 2014). The data of schoolsregarding their typeisshown below.

Table 3.1

Total Secondary Level School of Lalitpur District

Types of School	Number of schools	Percentage (%)
Community	79	28.01
Institutional	203	71.99
Total	282	100%

Source: Education and Human Resource Development Centre (2075)

Sample of the Study

A small portion chosen or taken out from population for studying its properties is called sample. Likewise, it is a part of population that is drawn from population in a scientific manner as representative of the population to describe population characteristics about any investigation. In the context of this research,the sample size and sampling have a major role to achieve the objective of the study. Therefore, they are described below under the separate headings.

Sample Size

Sample size is the number of participants(subjects). This is a counterpart in any research process because it helps researcher to take decision about sampling process. In survey research, most of researchers suggest that a large sample of population is essential to achieve adequate results to understand the phenomena and generalize it in whole population. Perhaps, there arises an inquiry about *large sample of population*for naïve researcher.However, the sample more than 30 is considered as large sample to run statistical analysis of research data (Best & Kahn, 2006; Pallant, 2016).But, this is not enough to get generalizable results about population in survey research. For this, the researcher must select participants using any established ground in research such as formula, effect size, literature review etc. Taking these issues into account, the researcher reviewed and analysed the literature of survey research about sample size as a naïve researcher to draw more authentic and adequate sample size. After analysis, the researcher found that 40 to 50 schools would be authentic and adequate sample size in case of absence of systematic list of population (Aikpitanyi & Eraikhuemen, 2017; Mutodi &Ngirande, 2014).

In order to get adequate sample size of teachers through schoolsfor this research, the researcher alsoused Krejcie and Morgan (1970) formula (For. 1) to assume actual sample size (number of schools) in term of schools.Moreover, according to Krejcie and Morgan (1970),

'to determine the actual sample size, projected sample size of research is at least 10 to 20 percent of the target population of the research" (as cited in Silwal, 2010); so to determine the actual sample size, the researcher decided to take some projected sample of school in absence of list of secondary teachers of Lalitpur district. Teachers were selected on the basis of school list assuming equal number of teachers in all schools and then researcher selected schools from whole population. Using the formula developed by Krejcie and Morgan (1970)

$$n = \frac{P.C.(100 \quad .C.)Z^2}{T^2}$$

Where n= actual sample size

P.C. = projected (pre-estimate) sample size

Z =1.96 at 95% confidence level

and

T = Margin errors (2% of 5%).

Let P.C. = 10 % of universe of population (283) = 28.3 ≈ 29

Z =1.96 at 95% confidence level

Margin errors (T) = 5 % from the universe population (203) = 14.15

Then, $$n = \frac{P.C.(P.C.-100)Z^2}{T^2}$$

$$= \frac{28.3(100-28.3)(1.96)^2}{(14.15)^2}$$

$$= \frac{7909.8544}{200.2225}$$

$$=39.51 \approx 40$$

From the above assumptions, the actual sizerepresents (n) = 40 Secondary schools of Lalitpur district. This sample size of schools was also supported by literature(Aikpitanyi & Eraikhuemen, 2017; Mutodi & Ngirande, 2014).

Sampling Procedure

Sampling procedure is a way that researchers use to select sample and collect data from the field. the researchers often suggestto use simple random sampling insurvey research due to its underlying theoretical nature to select unbiased randomsubjects for research (Baker et al., 2013; Kriska, Sass,& Falcomer, 2013).However, the random sampling taken in social setting and working with human subject often seem convenient in some extent due to ethical considerations (Kriska et al., 2013).Moreover, there are other issues such asrespectparticipants' right to drawback from a study, and elude the chances of nonresponse and low response rate of participants in the studythat researchers must complete within limited cost. Therefore, sample random sampling is not often possible case in real-life research (Kriska et al., 2013; Pallant, 2016).

Incase of this study, simple random sampling was not possible in the current contextdue to absence of systematic list of secondary level mathematics teachers of Lalitpur district(Fowler, 2014; Lunenburg & Irby, 2008)and to present desired domains and multiple variables in the study (Valliant, Dever,& Kreuter, 2018). Therefore, the researcher selected sample by school's categoryin the absence of systematic list of population and nature of available basis of population(Lunenburg & Irby, 2008). The sample size can be shown in the table below:

Table 3.2

Sampling Secondary School of Lalitpur District by Category

School' Category	Number of School
Community	10
Institutional	30
Total	40

Therefore, the sampling procedure used in the research seems convenient sampling procedure.

According to Best and Kahn (2006), researchers can use the convenience sampling in the survey research eventhey wish to use standard statistical technologies for data analysis because several empirical studies(Donaldson, Gallimore, & Swanson, 2019;Francine, 2012;Mohamed & Waheed, 2011; Ucar & Canpolat, 2019) have used inferential statistics even if their sampling is convenience sampling.

Survey Instrument

In the survey research, there are various instruments such as questionnaire, interview, and opened questionnaire, etc. Those are used to collect data from sample. In the context of this research, the researcher used questionnaire as instrument of this study. In the absence of an existing instrument as required by the nature of the study to examine secondary level mathematics teachers' perceptions on the integration of ethnomathematics, the researchers developed a set of questionnaires to elicit data about the characteristics or opinions of the respondents (May, 2001) using Five-Likert options to meet the research objectives of this research. The self-administered process is explained below under different headings.

Instrument Construction Process

This cross-sectional survey study was supposed to use self-administered questionnaire as instrument. Therefore, the researcher reviewed literature regarding thecontents of this research and methodology books in terms of getting some ideas about the development of statements on the subject tomeasure teachers'perception. After that,he consulted his supervisor andmade conceptual framework for this research (see Figure 2.1).At early stage,76 questionnaire statements were developed to grasp teachers' perceptions on the integration of ethnomathematics through four sources of the integration (i.e. curriculum, textbook, classroom process and teacher learning) in secondary level. Subsequently, the researcher consulted his supervisor with developed statements and this process continued whenever the statements clearly did not reflect the essence about teachers' perceptions on the integration of

ethnomathematics in secondary level and the sources of integration. At last, the researcher developed 116 statements related to four sources (curriculum, textbook, classroom process and teacher learning) regarding teachers' perceptions on the integration of ethnomathematics in secondary level in collaboration with his supervisor.All statementswere prepared placing five options (five Likert Scale) ranging on a continuum from "stronglydisagree" to "strongly agree" for each statement in final draft of questionnaire.

To ensure content validity, the resultant poll of items was subjected to the scrutiny and evaluation of expert of Kathmandu University School of Education [KUSOED]. The self-administered questionnaire wasalso sent to the experienced faculty members of KUSOED, different experts, the researcher's colleagues, etc. to check ambiguity, wording, and content overlap in statements. Likewise, the Likert Scale statements of the questionnaire were also checked by language experts to improve the statements and make them unbiased regarding word ambiguity before sending to ensure face validity. Subsequently, the researcher sent the questionnaire to 12 mathematics teachers of Mahottari district who were teaching at secondary level to ensure face validity and get feedback for further improvement like ambiguity and wording. According to their suggestions, he revised, removed and added and then the final set was made. In this process, 10 statements were removed from the questionnaire and other statements were improved because of experts' suggestion and then he sent draft to his supervisor for final comments. This process generated 106 items.The improved questionnaire was checked again by language experts before piloting.

Likert Scale Measurement

Likert type of statements are often used in real life research by the researchers to measure soft things such as perception, attitude, behaviour, etc. The researcher also desired to measure teachers' perceptionson the integration of ethnomathematics in this study. Therefore, the researcher developed 106 statements covering four sources onthe integration of

ethnomathematics namely; curriculum, textbook, classroom process and teacher learningregarding teachers' perceptions on the integration of ethnomathematics. Statements in questionnaire were coded in five-rating scale, i.e. strongly disagree, disagree, neutral, agree and strongly agree for each statement to measure teachers'perceptions on the integration of ethnomathematics because the five Likert type of data was able to fulfil the purpose of research and,to tackle teachers' perceptions on the integration of ethnomathematics rather than else Likert type of data.

Regarding rating, "strongly agree" option was used in statement to indicate teacher perception is strongly agreed with such statement and it was coded as '5' during data analysis process. Similarly, "agree" option was used in statement to indicate teachers' perceptionsis agreed with such statement and it was coded as '4' during data analysing process. Likewise,"neutral"option was used in statement to indicate teachers are sure or not sure about such statement. It means they are not sure about integration of ethnomathematics.Correspondingly, "disagree" and "strongly disagree" were used in statement to indicate that teachers' perceptions are disagree and strongly disagree with such statements respectively. The summary table is shown below.

Table 3.3

Summary table of Likert Item Rating

S. N	Statement	Rating Mark
1	Strongly Disagree	1
2	Disagree	2
3	Neutral	3
4	Agree	4
5	Strongly Agree	5

Pilot Test

The researcher conducted pilot test in the field to test the reliability and validity of the instrument. Moreover, the purpose of the pilot test was also to refine the statements of the

instrument. Rea and Parker (2014) suggested that twenty to forty participants are good to conduct pilot study in small population. In the context of this research, the researcher conducted the pilot study in Mahottari district. Therefore,there were taken 40 secondary mathematics teachers of Mahottari districtin the pilot survey of this study.

The researcherhad distributed theself-administered instrument by face to face meeting to 40 mathematics teachers who were teaching in secondary level in Mahottari district because the nature of population of it was the same as the nature of population of Lalitpur District and other hands, the survey questionnaire was also designed to find out mathematics teachers'perceptionson the integration of ethnomathematics. The researcher collected data of the pilot study by the follow up process. The return rate was 100%.

Refinement of Statements

The pilot data was analysed by using SPSS23[Software Program for Social Sciences 23]. Moreover, the researcher consulted his supervisor before refining the statements of instrument because each item of instrument has its own essence to be the part on the instrument regardingteachers' perceptions on theintegration of ethnomathematics and related sources such as curriculum, textbook, classroom process and teacher learning. Therefore, the researcher used thumb rules to refine statements from 106 statements. The researcher basically used six statistical thumb rules such as mean of items, SD, item-total correlation, skewness and kurtosis, anti-image matrices diagonal value, etc. A thumb rule criteria for item selection on the basis of mean, Jang and Roussos (2007) suggest that the mean between 2 to 4 are to be accepted and other are to be rejected for further process. Taking above thumb rule about mean into account, 37 items were selected and 69 were rejectedon the basis of mean. Similarly,26 items were selected and 11 were rejected on the basis of SD suggested by Jackson (1970) regarding the standard deviation greater than 1 is to be accepted and other to be rejected. Likewise, taking the suggestion of Field (2005; 2013) regarding item-total

correlation criterion “less than 0.20 or 0.30” of item to be rejected, one item having item-total correlation less than 0.30 was eliminated from instrument. In the same way, one item having skewness and kurtosis greater than absolute value 3 and 8 was eliminated from instrumentbased on the criterion suggested by Finney and DiStefano(as cited in Junnarkar, Singh,& Kaur, 2016, p. 21). At the last two items were eliminated having anti-image matrices diagonal value less than 0.50 from instrument on the basis of the criterion suggested by Field (2013).After item analyses, there were eight, three, eight and three items retained in curriculum, textbook, classroom process and teacher learning respectively. Furthermore, the retained items were placed at final instrument to collect data from the field. The retained items are shown domain wise below (see Table 3.3).

Table: 3.4

Distribution of Items in Different Domain

Domain	Items
Curriculum	1,2,3,4,5,6,7,8
Textbook	9,10,11
Classroom Process	12, 13, 14,15,16,17,18,19
Teacher Learning	20,21,22

Reliability and Validity of the Study

In the social science, researchers try to measure abstract concept such as perception, attitude and opinion of people through different tools. In word of Dorofeev and Grant (2006) ‘soft measure’is difficult to develop absolute valid measurement tools to measure these soft concepts. Instead of it, we can use those measurement tools which should be both more reliable and valid to measure such abstract concepts. In the context of this research, the researcher addressed reliability and validity carefully. These are described below.

Reliability

Reliability concerns with consistent responses of about instrument. According to Nunnally and Bernstein(1978), reliability is the stability of measurement over a variety of conditions in which basically the same results should be obtained. In the context of this study, the researcher conducted an internal consistency reliability test to measure the extent to which the items clustered initially within questionnaire. Cronbach's alpha was used to measure the reliability of instrument for all domains. In order to ensure reliability further, a pilot study was conducted using the instruments with some teachers of population with similar characteristics. Cronbach alpha value above 0.7 is acceptable (DeVellis, 2012). The instrument revealed perfect internal consistency with Cronbach alpha value (α) = 0.93.

The Cronbach's alpha reliability coefficients for the other constructs are shown below (see Table 3.5).

Table 3.5

Cronbach's alpha reliability coefficients

Cronbach's coefficient alpha		
Variables	Number of Items	Alpha (α)
Curriculum	8	0.847
Textbook	3	0.545
Classroom Process	8	0.822
Teacher Learning	3	0.766
Overall questionnaire	22	0.929

Validity

Validity concerns with what we want to measure.In other words, questionnaire that gets accurate responses from research respondent is called validity of tool and "it is an essential criterion for evaluating the quality and acceptability of research" (Burns, 1999, p.160) because it concerns with clarity and meaningfulness of the questionnaire and how much it is well- grounded and justifiable. Therefore, the researcherensured basic validity of instrument such as content, criterion-related and construct validity of instrument.

Content validity. Content validity concerns with the degree of content area which researcher wishes to measure. It can be determined by expert judgement (Lunenburg & Irby, 2008), extensive search of literature about content and respondent's judgement about instrument whether or whether not it is valid (Muijs, 2004). In this research, the researcher established content validity of instrument to measure an intended content through extensive review of literature about contents of all domains of instrument and then he consulted the experts of related field. Based on their suggestions, he made appropriate modification in statement. After that, he asked teachers for the comments on questionnaire whether it is valid to ensure face validity of instrument because it is the best way to achieve content validity (Muijs, 2004). Moreover, he asked panel of experts again to comment on the accuracy and appropriateness of the questionnaire items and their relevance to the study purpose.

Criterion-related validity. Criterion-related validity is basically related to theoretical knowledge of concept to choose suitable variables to interrelate with concept. For this, the researcher studied extensive review of theory related to concept for concurrent validity. According to Muijs (2004) "what is needed to establish criterion validity includes two aspects: a good knowledge of theory relating to the concept and secondly to statistically measure whether there is a relationship using techniques such as the correlation coefficient and Cronbach alpha" (p. 67). In this study, the researcher ensured concurrent validity by using both processes suggested by Muijs (2004) such as conducting a pre-test (pilot test) among some teachers from the same population by using the instrument to calculate Cronbach alpha.

Construct validity. Construct validity deals with degree of intellectual ability of instrument to measure abstract concept such as perception, behaviour, and attitude. It can only beensured by establishing both validity of instrument; content and criterion-validity

(Lunenburg & Irby, 2008) and the researcher established both as stated above under the subheadings like; content and criterion-related validity.

Method of Data Analysis

The collected data was analyzed using SPSS 23 program package in order to run descriptive and inferential statistics. Moreover, the descriptive statisticslike,(frequencies, percentages, measure of central tendency and measure of dispersion) was used to describe about sample characteristics through the collected data. Likewise, inferential statistics, i.e., Pearson product-moment correlation, t-test and ANOVAwas used to infer population through the sampled data. More concisely, Pearson product-moment correlation wasused to test the hypothesis related to research question one (from hypothesis one to six). One sample t-test was used to test the hypothesis related to research questions; two and three (from hypothesis seven to elven). Furthermore, t -test and ANOVA wereused to test hypothesis related to research question four (from twelve to twenty-two) in terms of the dependent variable which met parametric assumption like normality and homogeneity and then the suitable parametric test was used to test these hypotheses. Otherwise, the alternate nonparametric tests (Mann Whitney U test as alternate of t-test and the Kruskal-Wallis testas alternate of one-way ANOVA)were used to test these hypotheses instead of parametric tests.

Data Collection

The data were collected by the researcher in two ways. The first method consisted of university protocol to send instrument in an envelopeenclosed with supervisor's recommendation letter to schools and the second method consisted walk survey. At the beginning, the researcher sent enclosed envelope with instrument and recommendation letter of supervisor in different schools of Lalitpur district to include all different parts of the district in research process. After that, he went with instrument in an envelope enclosed with supervisor recommendation letter in those schools which are selected from quota sampling.

In this process, some school did not participate in this research due to their technical reason. For this, the researcher used nearest schools for data collection instead of those schools without any incentives in survey. The follow up process was used to get more response in study to include more participants.

At the end of data collection process, the researcher collected 80 completed survey forms with their demographic information and their opinion about the statements which was reflected the perceptions of teacher about integration of ethnomathematics from 42 schools of Lalitpur District. The distribution of community and institutional schools are shown table below.

Table 3.6

Total Number of Sampled of Teacher and Secondary School of Lalitpur District

Types of School	Number of School	Number of Teacher
Community	8	11
Institutional	34	69
Total	42	80

Ethical Considerations

Ethical considerations play a significant role in research because a researchconducted for social benefits without any potential life alters harm of both; researcher and participants. But it always occurs during research process to achieve knowledge about social issue for the academic purpose. So, researchers cannot successfully accomplish the task of research ignoring them and "they must balance two competing priorities: maximizing protection of participant's identities and maintaining the value and integrity of the data" (Saunders, Kitzinger,& Kitzinger, 2014, p. 2). They are fundamental norms of the research and major responsibility of the researcher to complete the research with ethical approvaland give proper attribution to all outside sources in academic research(AmericanPsychological Association [APA], 2013). This binds researchers within periphery of norms and values.

In the case of this study, the researcher obtained his ethical approval before any research activity and he had actively considered the following ethical issues in course of doing the study: firstly, the researcher's identity and background was fully disclosed. Secondly, the purpose, significance and procedures were fully explained to the respondents, thirdly, the respondents were ensured that the research would be beneficial for the pedagogical practices. Moreover, the participants were not forced to participate in this study. Similarly, the dignity, privacy and anonymity of the respondents received due consideration. Likewise, the respondents were ensured that the research would not harm them in any way and finally, the study was conducted among secondary level teachers with permission of the head teacher of the school.

CHAPTER IV

DATAANALYSIS AND INTERPRETATION

Chapter Overview

This chapter begins with the data summary in terms of response rate and missing data. It also includes descriptive analysis of sample'scharacteristics in relation to demographic, educational and professional independent variables, which are obtained from the survey. Furthermore, the assumption and its criteriaare also presented before performing any statistical analysis. Likewise, the post reliability of instrument takes places following the statistical analysis. The research hypotheses of research questions are tested in order to present the results using appropriate statistical technologies.

DataSummary

In survey research, there are numerous ways to collect data from the field such as interview, observation, standard survey questionnaire, etc. This study used self-administered survey questionnaire mentioned in earlier chapter as the way to collect data from the field.Researchers often face low response rate and high missing datain the survey study. However, this survey study has achieved high response rate with minimal missing.

Response Rate

Forty- five schools were selected for this survey research in order to include forty schools as mentioned in sample size. The researcher dropped the instrument himself in schools and informed sampled teachers about the aim of this study. Moreover, heinformed teachers about the instructions to complete the questionnaire. Furthermore, the instructions werealso attached with instrument in a sealed envelope. Forty-two schools agreed to participate in this research and three schools did not. From these 42 participated schools, 80

completed questionnaires were collected at the end of the data collection phase. The questionnaires were collected by the follow up process. A follow up of the questionnaires showed a good response rate from the research participants. The researcher dropped instruments in (forty-five schools) more schools than given sample size (forty schools) of the study. Fleiss, Levin, and Paik(2013) suggested that response rate should be above 60% acceptable to continue analysis of the data. The response rate of 93.33% was sufficient enough to elude from suggestion.

Missing Data

A total of 80 secondary level mathematics teachers from 42 schools responded toward self-administered questionnaire about teachers'perceptions on the integration of ethnomathematics, and on the sources of the integration of ethnomathematics. After analysis, the researcher found minimal missing response toward latent variables. The researcher put neutral (average) value of item to address those missing value and included item in analysis process (Cohen et al., 2018). Moreover, the researcher chose to replace any missing response with the mean average of response remaining questions that pertained to the same source of integration of ethnomathematics (Pallant, 2016). Therefore, the missing data did not significantly impact the overall score of the sources of the integration of ethnomathematics per teacher. Additionally, pairwise deletion was chosen over list wise deletionduring the process of performing the statistical analysis using SPSS to include as much data as possible within each analysis. The summary of valid and missing valueof demographic independent variables are presented below (see Table 4.1).

Table 4.1

Summary of Demographic, Educational and ProfessionalIndependent VariablesRegarding Valid and Missing Value

Variables	N	
	Valid	Missing

Demographic		
Gender	80	0
Age	79	1
Religion	77	3
Family occupation	73	7
Educational Independent		
Schooling background	80	0
Graduated faculty	79	1
Academic qualification	80	0
Professional Independent		
Teaching background	80	0
Employment status regarding placement	80	0
Employment status regarding time	80	0
Teaching Experience	80	0
Training attendance	80	0

Analysing table 4.1, teachers' characteristics regarding demographic, education and profession, in case of missing data, may be summarized as follows: 80 educators responded to self-administered instrument regarding teacher perceptions on the integration of ethnomathematics in secondary level, the highest number of respondents who did not respond regarding their family occupation are seven mathematics teachers, representing 8.75%. Moreover, three teachers, representing 3.75%, did not respond about their religion. Similarly, the missing data found that one mathematics teacher, representing 1.25%, did not respond in age and the similar result was found in graduated faculty too.

Data Analysis

Data analysis involved quantitative data analysis collected from teachers during surveying process. The researcher went through all information filled up by teachers about their demographic, educational and professional characteristics; and their responses on 22 Likert type statements variables into the SPSS 23 [Statistical Package for Social Sciences 23]. Pallant (2016) suggests that the researcher should clean data file to make error free before data analysis because simple error in the data filecan mislead the whole research

results.Therefore, the data file was cleaned carefully using different techniques provided in SPSS 23.

According to Boone and Boone (2012) the researcher must explore the nature of latent variables to use proper statistical tools to address research question. More precisely, whether the Likert item stand alone or set of Likert items stand to serve the purpose of research. It is also supported by Pallant (2016). Taking their suggestion into account, the researcher inspected the nature of the dataand found that the set of Likert items were used to measure the teachers' perceptions on the integration of ethnomathematics. Therefore, the researcher coded and calculated mean score of group of items and created new Likert Scale variable. Furthermore, the researcher did the same process to create other new Likert Scale variables regarding sources of the integration of ethnomathematics like curriculum, textbook, classroom process and teacher learning. These new variables such as perception, curriculum, textbook, classroom process and teacher learning are the mean scores of twenty-two, eight, three, eight and three items in this study respectively and each specificallypertained to that source.

The distribution of the secondary level mathematics teachers' perceptions on the integration of ethnomathematics was determined through descriptive statistics (i.e., frequencies and percentages) regarding teacher demographic variables namely; personal, educational and professional independent variables and are presented in different tables separately. Moreover, mean and standard deviation were used to describe teachers' demographic variables of the study and dependent variables such as curriculum, textbook, classroom process and teacher learning; and inferential statistics (i.e., Pearson product-moment correlation, independentsample t-test, Mann Whitney U test and one-way ANOVA) were run to infer about population through sample regarding the integration of ethnomathematics in secondary level.

More concisely, Pearson product-moment correlation was used to check the

Variables	Frequency(*f*)	Percent (%)

relationship between sources of the integration of ethnomathematics. The statistical tools such as one sample t-test was run to determine secondary level mathematics teachers'perceptions on the integration of ethnomathematics in overall and teachers' perceptions on the sources of integration of ethnomathematics(i.e. curriculum, textbook, classroom process and teacher learning). Independent sample t-test was used to find significant difference between two independent groups which meet assumptionsof parametric test. The researcher used alternate nonparametric test of independent sample t-test like Mann Whitney U test to reveal significant difference between those two groups and whether their perceptions vary significantly depending on more than two independent groupsdetermined with One-Way ANOVA.

Demographic Data

The self-administered instrument regarding teachers' perceptions on the integration of ethnomathematicsalso contained questions intended to produce specific independent variable such as demographic,educational and professional characteristics of sampled teachers. These questions included questions about gender, age, religion, family occupation, schooling background,graduated faculty, academic qualification, teaching background, employment status regarding placement (permanent and temporary), employment status regarding working status (part- time or full-time), teaching experience and training attendance. These independent variables are categorized in three categories namely; demographic, educational and professional to present clear picture of independent variable of the study. The results are shown in Table 4.1, Table 4.2 and Table 4.3 respectively.

Table 4.2

Gender			
	Male	74	92.5
	Female	6	7.5
Age			
	20-30	24	30
	30-40	33	41.3
	40 above	22	27.5
Family Occupation			
	Agriculture	44	55
	Non-agriculture	29	36.25
Religion			
	Hindu	67	83.8
	Kirat	1	1.3
	Buddhist	7	8.8
	Christian	2	2.5
	Missing	3	3.8

Descriptive Statistics of Teachers' Demographic Factors: Gender, Age, Family Occupation and Religion

Analysing Table 4.2, according to the demographic information of teachers participated in the study as sample, 74, representing 92.5%, of teachers are male; and, 6, representing 7.5% of them are female in this study regarding gender groups. Furthermore, in age distribution, the highest accumulation is in "30-40 age" group with 41.3% and the least accumulation is in "40 above age" group with 27.5%. Similarly, according to teachers' family occupation, the accumulation in "agriculture" group is 44 with 55% of all participants and the accumulation in "non-agriculture" group is 29 with a rate of 36.25%. Likewise, the result regarding religion, the highest accumulation is in "Hindu" group with 67, representing 83.8% of teachers; and the least accumulation is in "Kirat" group with 1, representing 1.8% of teachers.Unfortunately, religious groups did not have enough sample size, therefore this particular characteristic will be not used in inferential data analysis part (see Figure 1).

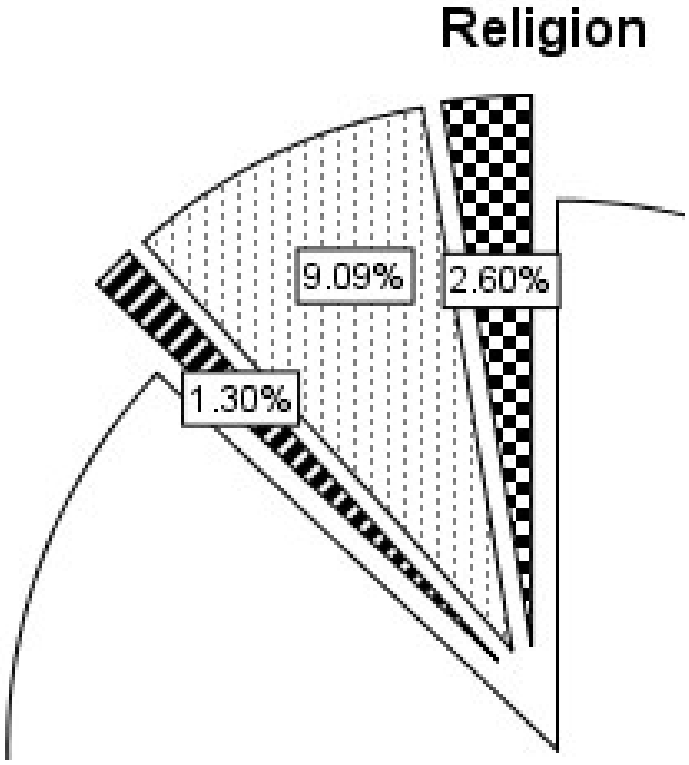


Figure 1. *The distribution of religion among sample*

Table 4.3

Number and Frequency of Educational Independent Variables: Schooling Background, Graduated Faculty and Academic Qualification

Variables	Frequency (*f*)	Percent (%)
Schooling Background		
Community	45	56.3
Institutional	35	43.8
Academic Qualification		
Below Bachelor	2	2.5
Bachelor	27	33.8
Master	44	55
Above Master	6	7.5
Graduated faculty		
Education	17	21.3
Science	45	56.3
Other	17	21.3

Analysing Table 4.3, according to demographic information of mathematics teachers regarding education. In schooling of teachers, the accumulation in "community" group is 45 with a rate of 56.3% and the accumulation in "private" group is 35 with a rate 43.3%. As per academic qualification, the highest level of accumulation is in "master" group with 44 (41.3%). The least accumulation is in "Bachelor below" group with 2 (a rate of 2.5%). According to Graduated faculty distribution of teachers, the highest level of accumulation is in "Science" group with 45 (56.3%) and the similar accumulation is in "Education" and "Other" group with 17 (21.3%).

Table 4.4

Number and Frequency of Professional Independent Variables: Teaching Background, Employment Status Regarding Placement, Employment Status Regarding Working Time, Teaching Experience and Training Attendances

Variables	Frequency (*f*)	Percent (%)
Teaching Background		
Community	11	13.8
Institutional	69	86.2
Job Placement		
Permanent	28	35
Temporary	52	65
Working Status		
Part-Time	13	16.3
Full-Time	67	83.8
Teaching Experience		
0-5	18	22.5
5-10	21	26.3
10^{+}	41	51.3
Training attendances		
Not Yet	20	25
1-2 times	29	36.25
3 or above	31	38.75

Demographic variables of teachers related to their professional status are presented above (see Table 4.4) and it contains teachers' current teaching schooling types, employment

status regarding placement, employment status regarding working time, teaching experience and training attendance. In the teaching background distribution, the highest level of accumulation is in “private” group with 66, representing 82.5% of teachers. The least accumulation is in “other” group with 3, representing 3.8% of teachers. According to employment status regarding job placement, the accumulation in “permanent” group is 28 (35%) and the accumulation in “temporary” group is 52 (65%); the highest level accumulation in “employment status regarding working time” is 67 (83.8%) of “full-time” group and accumulation in “part-time” group is 13 (16.3%). In teaching experience distribution of teachers, the highest level is in “10 and above” group with 41 (51.3%) and the least accumulation is in “5 and less” group with 18 (22.5%). In training attendance variable, the highest level accumulation is in “3 or above” with 31 (38.75%) and the least accumulation is in “not yet” with 20 (25%).

Assumptions of Statistical Tests

In preliminary analyses of data, it was essential to inspect the assumptions of statistical tests before using them in research. There are two type of test i.e. parametric and non-parametric to inferabout population through sample. Most of the researchers often use parametric test in their research rather than non-parametric because it is considered as more powerful test in comparison of non-parametric test because of its mathematical underpinning logic (Cohen et al., 2018). But it is also necessary to meet a set of specific assumptions before using it. Using a parametric test without meeting assumptions increases greatrisk of inaccurate decisions. Therefore, the researcher must inspect the assumptions of test before using such tests (parametric and non-parametric).

According to Field (2000), the researcher must inspect about their data regarding four basic assumptions: normally distributed data, homogeneity of variance,interval data, and independence to get accurate inference about population. . Similarly, Pallant (2016) has also

suggested a set of specific assumptions; random, independent, interval data, normal distribution, and homogeneity of variance.But she has also suggested that all assumptions are often not the case in real-life research. According to Heiman (2011), there are two common specific assumptions for all parametric tests; data should be interval or scale, and it should be normally distributed.

In this research, the research purpose was concerned to measure the teachers' perceptions on the integration of ethnomathematics andteachers'perceptions on the sources of integration. To serve the purpose, the researcher wanted to use parametric test if it meets necessary assumption, otherwise the researcher would use non-parametric test so it is important to check whether the basic assumptions required of parametric and non-parametric are met or not. For this, the researcher inspected the data to get idea of any patterns and, to meet necessary assumptions of parametric and non-parametric test to run the statistical procedures for further procedure (Field, 2000). To meet basic assumptions of parametric test and non-parametric test, the researcher took Pallant's (2016) assumptions into account to make this research more authentic and reliable because the set of assumptions given by her was broader than other. The researcher also tookher suggestions regarding the violation of assumptions in case of real life research. Therefore, the violation of some assumptions may occur during research due to ethical considerations, interest, fund, accessibilityof population, time, etc. These assumptions such as random sampling, independence, interval data,normally distributed dataand homogeneity of varianceare presented below.

Random Sampling

This assumption states that the participants of the study should be randomly selected from population because the most of researcher believe that the participants selected randomly is unbiased. It cannot be ignored to achieve accurate result because the parametric test is based on mathematical logic.But some of the researchers argue that this is not often

case in real life research because of cost and easy access (Thompson, 2018).Dorofeev and Grant (2006) also argue that social science basically, in survey research, the researchers principally concern with “soft” measure such as attitude, perception and opinion of people through instrument which cannot be ensured by using full-probability sampling as well as the researchers must respect ethical considerations of academic research even they would like to include desired domains of the study. Therefore, the researcher agrees with Hays’s statement (1973) that “researchers should not take lightly the assumption of random sampling that is a premise for many statistical procedures” (as cited in Kriska et al., 2013, p. 2828). Pallant (2016) also suggests the same argument emphasised by Hays (1973). Therefore, this assumption can be violated in real-life research.

In case of this research, the researcher has not takenthe randomness assumption of parametric test lightly due to time, cost and the context of study with ethical considerations. Therefore, he violated this assumption to select sample using convenience sampling. Moreover, the researcher found several empirical studies (Donaldson et al., 2019; Francine, 2012; Mutodi & Ngirande, 2014; Ucar & Canpolat, 2019) that have used inferential statistics even their sampling is convenience one. Therefore, the researcher found theoretical basis to get away from randomness assumption of parametric test.

Independence

This assumption assume that participants should not be repeated in research and should not be affected from one another to respond. In real life research, there arises several cases where the researchers must take group of participants to serve the purpose. In this condition, the chances of violation may occur. Several research studies in real-life can be found those are violated this assumption (Pallant, 2016). For example, these empirical studies (Mutodi & Ngirande, 2014; Thompson, 2018; Ucar & Canpolat, 2019) have taken more than

one participant from each school. Therefore, this assumption can be violated in absence of systematic list of population.

In the context of this research, the researcher must have selected participants based on school rather than individual because of absence of systematic list of population and there was only alternative for the researcher to select participants from school. Therefore, the researcher violated this assumption. But the researcher took the response of teacher once in this research to meet independence assumption of parametric test that is clearly mentioned in sampling procedure of this research. Therefore, the researcher can get away from this assumption even he did not meet this assumption completely.

Interval Data

This assumption suggests that the data must be at the interval scale. This is the necessary criteria for the researchers if they wish to use parametric test in their study for data analysis. To serve the purpose of this research, the researcher combined series of Likert items to create new scale data to measure teachers' perceptions on the integration of ethnomathematics and teachers' perceptions on the integration of ethnomathematics through different sources such as curriculum, textbook classroom process and teacher learning. Therefore, the researcher met this assumption successively.

Normally Distributed Data

This assumption states that the data should be normally distributed to perform a parametric test.To meet this assumption, the researcher can use many alternate statistical information provided by statistical software packagesuch as histograms, skewness and kurtosis etc. However, this assumption can be violated in research and itoften occurs because many statistical softwareproducesbetter the results as a replacement for the violation of this assumption. Therefore, the researchers can run parametric test if the data is not normally distributed.

In case of this study, the researcher used SPSS 23 for data analysis. So, he checked normality of data by using several options provided by SPSS 23 such asthe use of histograms to determine normality, skewness, kurtosis, etc. Moreover, the histogram was used to determine normality of variables through figure clearly. In order to examine normality, the most part of histogram should be inside the normal curve. The normality of variables are shown in Figures (see Figure 2, Figure 3, Figure 4, Figure 5 and Figure 6).

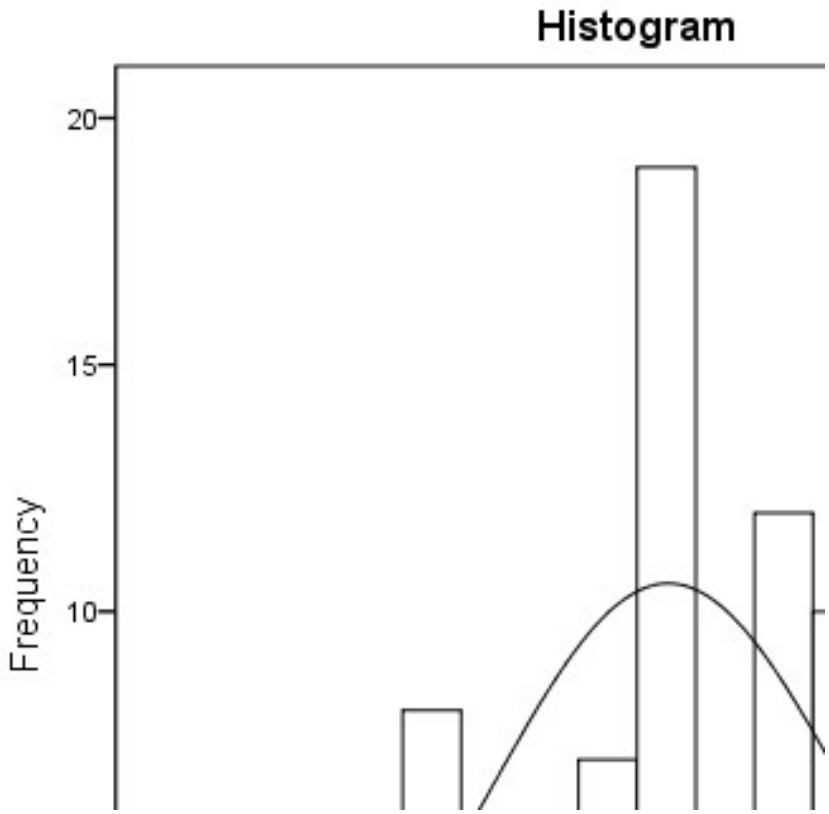


Figure 2. Normal Curve of Perception

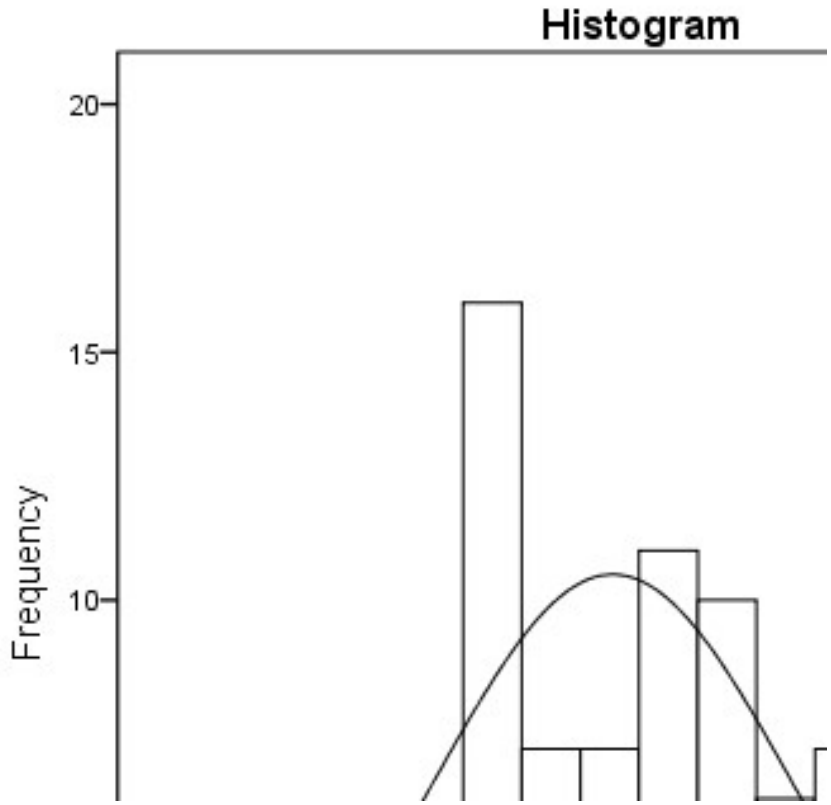


Figure 3. Normal Curve of Curriculum

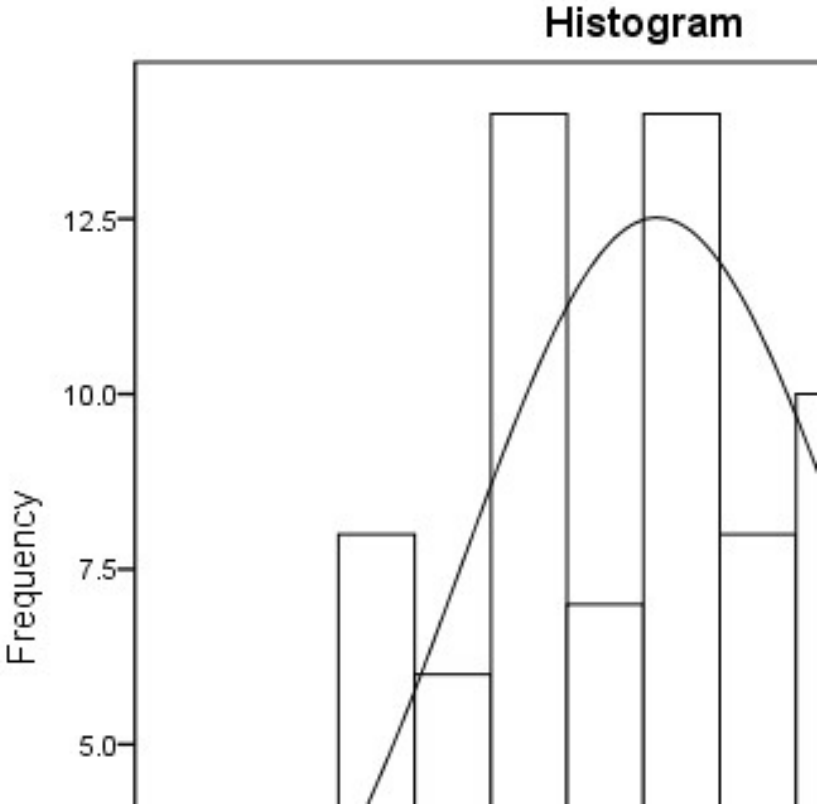


Figure 4. Normal Curve of Textbook

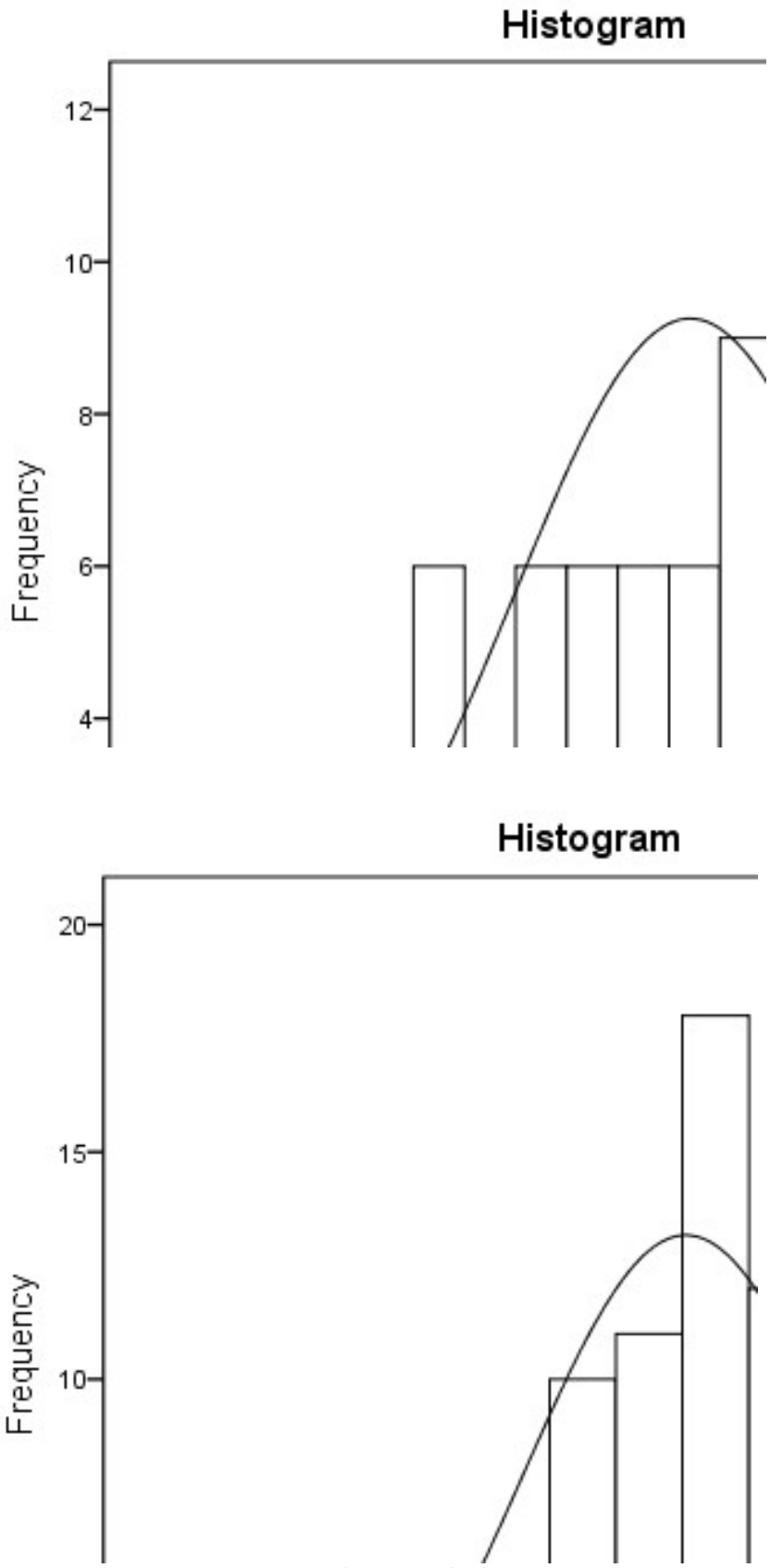


Figure 5. Normal Curve of Classroom Process

Figure 6. Normal Curve of Teacher Learning

In the above figures, most of parts of data are inside of normal curve. Therefore, these variables are normally distributed.

Moreover, the researcher also used absolute value of the skewness and kurtosis of each dependent variable to inspect the normally of data. It was found that the absolute value was less than 1, so it revealed that the data were normally distributed (see Table 4. 5). In addition, the researcher also extended the inspections of normality to include measures of kurtosis and skewness regarding their statistic and standard error and the researcher found that the range of kurtosis and skewness were between twice the standard error which is accepted as normal (Cohen et al., 2018). Taking it into account, the researcher inspected the normality criteria of data and all variables revealed normal distributions (see Tables 4.5). Therefore, the parametric tests were used for the analysis in most case.

Table 4.5

Descriptive Statistics for the Five Dependent Variables

Variables	*N*	*M*	*SD*	Skewness		Kurtosis	
				Statistic	Std. Error	Statistic	Std. Error
Perception	80	3.3705	.68620	-.261	.269	.415	.532
Curriculum	80	3.1375	.75855	.185	.269	.105	.532
Textbook	80	3.2250	.84988	.125	.269	-.602	.532
Classroom Process	80	3.6031	.86208	-.514	.269	-.396	.532
Teacher Learning	80	3.5167	.80766	-.457	.269	.423	.532

Homogeneity of Variance

This assumption means that the variances of the populations being represented are equal. In addition, this assumption states that these groups come from populations with the same variance. In the context of this research, the researcher used Levene's test for

homogeneity of variances during analysis process. A thorough analysis of the data revealed similar stable variances across all of the variables.

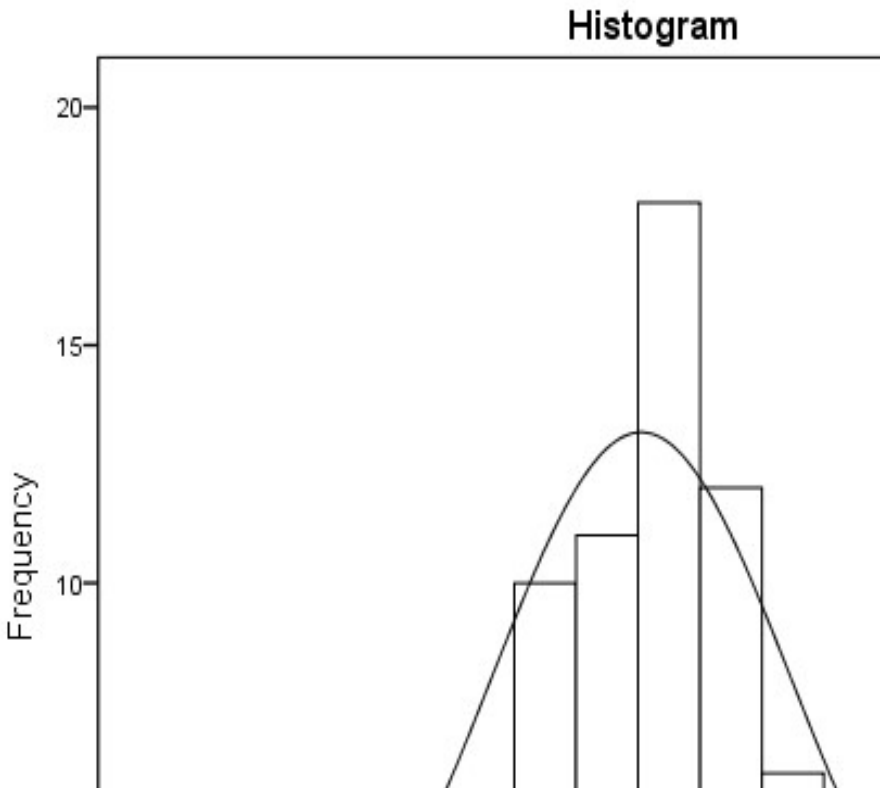
In summary, the researcher almost met all necessary assumptions of parametric test so the researcher used parametric test. But some criteria regarding sample size, some independent variables, i.e. gender, teaching schooling type and employment status regarding working timedid not meet the sample size criteria (more than 15 in each group) and several research studies have shown that these demographic factors play a vital role to influence teachers' perceptions so the researcher decided to use non-parametric test to test the hypotheses regarding to these variables.

Post Reliability of Tools

To ensure construct validity, the searcher calculated Cronbach's alpha coefficient and a strong and positive internal consistency of instrument was found with α= 0.92. This was almost equal to internal consistency of the piloted data. So, it confirmed construct validity of instrument (see Table 4.6).

Table 4.6

Cronbach's Alpha Coefficient of Construct (Sample Response Reliability)



Cronbach's coefficient alpha

Variables	Number of Items	Alpha (α)
Perception	22	0.92

Testing Hypotheses of Research Questions

Descriptive and inferential statistics were used to investigate twenty-two hypotheses of four research questions of this study. Pearson product-moment correlation coefficient was used to investigate thesix hypotheses related tothe first research question. Moreover, one sample t-test was used to investigate five research hypotheses related to the researcher questions two and three. Moreover, independent sample t-test was used to compare the amount of mean between two independent groups and significant differences between two groups. Analysis of Variance (ANOVA) was used to compare the amount of variance between more than two independent groups or demographic factors with post-hoc comparisons in the context of one-way ANOVA to find out which groups are significantly different from one another. Furthermore, Mann Whitney U test was also used to compare the mean rank between two independent groups, i.e. gender, employment status and teaching background. The level of significance was .05 consistent with commonly used statistical practices (Clark, 2002;Gall, Borg,& Gall, 1996; Ogunkunle & George, 2015). Therefore, the researcher used level of significance as .05 for each statistical analysis used in this study.

Research Question One

What are the relationships among sources such as curriculum, textbook, classroom process and teacher learning regarding teachers' perceptions on the integration of ethnomathematics?

The researcher tested the hypotheses related to research question one before answer the researcher question one. The hypotheses are presented below those were tested by using Pearson product-moment correlation.

Hypotheses of Research Question One

Null Hypothesis 1. There is no relationship between curriculum and textbook regarding teachers' perceptions on the integration of ethnomathematics in secondary level.

Null Hypothesis 2. There is no relationship between curriculum and classroom process regarding teachers' perceptions on the integration of ethnomathematics in secondary level.

Null Hypothesis 3. There is no relationship between curriculum and teacher learning regarding teachers' perceptions on the integration of ethnomathematics in secondary level.

Null Hypothesis 4. There is no relationship between textbook and classroom process regarding teachers' perceptions on the integration of ethnomathematics in secondary level.

Null Hypothesis 5. There is no relationship between textbook and teacher learning regarding teachers' perceptions on the integration of ethnomathematics in secondary level.

Null Hypothesis 6. There is no relationship between classroom process and teacher learning regarding teachers' perceptions on the integration of ethnomathematics in secondary level.

To examine the hypotheses of research question one, the researcher conducted Pearson product-moment correlation coefficient and the results are presented below.

Table 4.7

Correlation amongSources (i.e. Curriculum, Textbook, Classroom Process and Teacher Learning) regarding Teacher Perceptions on the Integration of Ethnomathematics

		Curriculum	Textbook	CP	TL
Curriculum	Pearson Correlation				
	Sig. (2-tailed)				
	N				
Textbook	Pearson Correlation	.617**			

	Sig. (2-tailed)	.000		
	N	80		
CP	Pearson Correlation	.515**	.570**	
	Sig. (2-tailed)	.000	.000	
	N	80	80	
TL	Pearson Correlation	.575**	.458**	.787**
	Sig. (2-tailed)	.000	.000	.000
	N	80	80	80

Note. CP- Classroom Process, TL= Teacher Learning, **. Correlation is significant at the 0.01 level (2-tailed).

The relationship among sources, i.e. curriculum, textbook, classroom process and teacher learningregarding teacher perceptions on the integration of ethnomathematics was investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity.

There was a strong, positive correlation between the two variables, $r = .617$, $n = 80$, $p < .001$, with high levels of perceived curriculum associated with high levels of perceived textbook.The result shows that integration of ethnomathematics through curriculum also helps teachers to perceive the integrations of ethnomathematics through textbookin secondary level.

Similarly, there was also a strong, positive correlation between the two variables curriculum and classroom process, $r = .515$, $n = 80$, $p < .001$; a strong, positive correlation between the two variables textbook and classroom process, $r = .570$, $n = 80$, $p < .001$. The result shows that integration of ethnomathematics through curriculum and textbook also helps teachers to perceive the integrations of ethnomathematics through classroom processin secondary level.

The relationship between, curriculum and teacher learning,$r = .575$, $n = 80$, $p < .001$; classroom process and teacher learning, $r = .787$, $n = 80$, $p < .001$ revealed that there was a strong and positive correlation in relation to teachers' perceptions on the integration of

ethnomathematics in secondary level. This means the integration of ethnomathematics in curriculum and classroom process extremely helps teachers to perceive the integration of ethnomathematics through teacher learning and vice versa. But, there was a moderate, positive correlation between variables, $r = .458$, $n = 80$, $p = .001$, textbook and teacher learning (see table 4.7). This meansteacher learning moderately helps teachersto perceive the integration of ethnomathematics in textbook.

Research Question Two

What are the teachers' perceptions on the integration of ethnomathematics in secondary level?

To answer the research question two, the researcher formulated a research hypothesis.

Null Hypothesis 7. There is neutral perception of mathematics teachers on the integration of ethnomathematics in secondary level.

To examine the hypothesis of research question two, the researcher used one sample t-test and the result is shown in Table 4.8.

Table 4.8

One Sample t-test for Dependent Variable, Perception

	N	*M*	*SD*	*t*	*df*	*p*
Perception	80	3.37	0.69	43.93	79	.000

*$p < .05$, Sig. (2-tailed)

Analysing Table 4.8, the value of $t\ (79) = 43.932$, $p < .05$ so the null hypothesis is rejected. It can be concluded that there is no neutral teachers' perceptions on the integration of ethnomathematics. This means teacher perceive that either ethnomathematics is not being integrated or it is being integrated in secondary level. It can be observed using mean value and the mean value ($M = 3.37$) of participants on dependent variable (perception) is greater than neutral value. Therefore, it can be concluded that there is moderate (positive)teachers'perceptions on the integration of ethnomathematics. However, the mean

score is closer to neutral value which shows that teachers' perceptions do not help teachers to integrate ethnomathematics in secondary level.

Research Question Three

What are the teachers' perceptions on the integration of ethnomathematics regarding different sources such as curriculum, textbook, classroom process and teacher learning?

To answer the research question three, the researcher formulated four research hypotheses.

Null Hypothesis 8. There is neutral perception of mathematics teachers on the integration of ethnomathematics in secondary level through curriculum.

Null Hypothesis 9. There is neutral perception of mathematics teachers on the integration of ethnomathematics in secondary level through textbook.

Null Hypothesis 10. There isneutral perception of mathematics teachers about the integration of ethnomathematics in secondary level through classroom process.

Null Hypothesis 11. There is neutral perception of mathematics teachers on the integration of ethnomathematics in secondary level through teacher learning.

To examine the hypotheses of research question three, the researcher conducted series of a sample t-test regarding teacher perceptions on the integration of ethnomathematics through difference sources such that curriculum, textbook, classroom process and teacher learning. The results are shown in the table below.

Table 4.9

One sample t-test Result Regarding Perceptions of Teachers on Sources of Integration of Ethnomathematics: Curriculum, Textbook, Classroom Process and Teacher Learning

Sources of Integration	*N*	*M*	*SD*	*t*	*df*	*p*
Curriculum	80	3.14	0.76	37.00	79	.000
Textbook	80	3.23	0.85	33.94	79	.000
Classroom Process	80	3.60	0.86	37.38	79	.000
Teacher Learning	80	3.52	0.81	38.94	79	.000

*$p < .05$, Sig. (2-tailed)

Analysing Table 4.9, the one sample t-test result regarding the sources of integration curriculum, textbook, classroom learning and teacher learning are t (79) = 37.00, $p < .05$; t (79) = 33.94, $p < .05$; t (79) = 37.38, $p < .05$ and t (79) = 38.94, $p < .05$ respectively. Therefore, the null hypotheses can be rejected regarding teachers' perceptions on the integration of ethnomathematics through such sources of integration such as curriculum, textbook, classroom process and teacher learning. It can be concluded that there are not neutral teachers' perceptions on the integration of ethnomathematics.Moreover, the mean value of participants on dependent variables (curriculum, textbook, classroom process and teacher learning) are greater than neutral value in above table. So, it is concluded that there are positive perceptions of teachers on the integration of ethnomathematics through such sources. This means integration of ethnomathematics is being noticed by teachers in different sources such as curriculum, textbook, classroom process and teacher learning but the integration of ethnomathematics through classroom process is extremely perceived (with M = 3.60) by teachersin comparison to other sources of integration. The integration of ethnomathematics through curriculumis rarely perceived (with M = 3.14)by teachers in comparison to other sources of integration.

Research Question Four

What are the demographic factors that contribute to secondary level mathematics teachers' perceptions on the integration of ethnomathematics?

To answer the research question four, the researcher formulated eleven hypotheses regarding teachers' demographic characteristics such as gender, age, religion, family occupation, schooling background, academic qualification, graduated faculty, teaching background, job placement, employment status (working time), teaching experience and training attendance. To test hypotheses, the researcher conducted non-parametric and

parametric test. Non-parametric test such as Mann Whitney U test was used to find the significant difference between groups of variables such as gender, employment status regarding working time and teaching background because the participants were less than 15 in one group of each variable (see Table 4.10).

Independent sample t-test was calculated to assess whether teacher demographic factors, i.e. family occupation, schooling background, academic qualification and employment status regarding placement influence teachers' perceptions on the integration of ethnomathematics. At last, the researcher used ANOVA to find out whether there is significance or not, among groups of variables, i.e. age, teaching experience and training attendance.

Mann Whitney U test on perception. Research question four sought to find out which the researcher generated hypotheses according to participants' independent factors. In order to examine the significant difference between groups of independent variables, the researcher used Mann Whitney U test to test the significant difference between the groups of gender, employment status regarding working time and teaching background due to low sample size in one group in each independent variable.

Null Hypothesis 12. There is no significant difference between gender of the teachers' perceptions on the integration of ethnomathematics.

Null Hypothesis 13. There is no significant difference between working status of the teachers and their perceptions on the integration of ethnomathematics.

Null Hypothesis 14. There is no significant difference between teaching background of the teachers and their perceptions on the integration of ethnomathematics.

To test the above hypotheses, the researcher calculated Mann Whitney U test and the results are presented in Table 4.10.

Table 4.10

Mann Whitney U Test Result of Group Variables on Perception: Gender, Employment Status and TeachingBackground

Group Variable	*N*	Mean Rank	*U*	*z*	*p*	*r*
Gender						
Male	74	39.74	166.00	-1.024	.306	.114
Female	6	49.83				
Employment Status						
Part-Time	13	44.85	379.00	-.737	.461	.082
Full-Time	67	39.66				
Teaching Background						
Community	11	36.18	332.00	-.664	.507	.074
Institutional	69	41.19				

Note. $*p < .05$, Sig. (2-tailed)

The result of A Mann-Whitney U Test regarding gender groups revealed that there was no significant difference in perceptionsof male teachers (Mean Rank = 39.74, n =74) and female teachers (Mean Rank = 49.83, n = 6), U = 166.00, z = –1.024, p = .306, r = .114 on the integration of ethnomathematics even the difference between their mean rank is larger than 10. However, the gender variable has medium impact on the perceptions regarding the integration of ethnomathematicsdue to medium effect size (r = .114).

Moreover, a Mann-Whitney U Test revealed no significant difference in the perceptions of part-time teachers (Mean Rank = 44.85, n =13) and full-time teachers (Mean Rank = 39.66, n = 67), U = 379.00, z = –.737, p = .461, r = .082 on the integration of ethnomathematics and employment statushas less impact on teachers' perceptions regarding the integration of ethnomathematics.

The same results revealed a Mann-Whitney U Test regarding teachers' perceptions on the integration of ethnomathematics the respondents were the teachers of community schools (Mean Rank = 36.18, n =11) and institutional (Mean Rank = 41.19, n = 69), U = 312.00, z = –.743, p = .457, r = .083 and teaching background has less impact on teachers' perceptions on the integration of ethnomathematics.

Independent t-test on perception. In order to examine the significant difference between groups of independent variables such as family occupation, academic qualification, job placement and schooling background of teachers, the researcher used independent t-test because each independent variable met all necessary assumptions in order to run parametric t-test.

Null Hypothesis 15. There is no significant difference between the family occupation (agriculture and non-agriculture) of the teachers and their perceptions on the integration of ethnomathematics.

Null Hypothesis 16. There is no significant difference between the academic qualification of the teachers and their perceptions on the integration of ethnomathematics.

Null Hypothesis 17. There is no significant difference between job placement (permanent and temporary) of the teachers and their perceptions on the integration to ethnomathematics.

Null Hypothesis 18. There is no significant difference of the teachers' perceptions on the integration of ethnomathematics due to schooling background.

Table 4.11

Independent t-test on Perception: Family Occupation, Academic Qualification, Job Placement and Schooling Background

	N	*M*	*SD*	*t*	*df*	*p*	η^2	95% CI	MD
Family Occupation									
Agriculture	44	3.32	0.60	-0.79	71	0.432	.009	[-0.47, 0.20]	-0.134
Non-agriculture	29	3.45	0.85						
Academic Qualification									
Bachelor	28	3.45	0.75	0.78	70	0.44	.008	[-0.21, 0.47]	0.131
Master	44	3.32	0.67						
Job Placement									
Permanent	28	3.32	0.74	-0.45	78	0.653	.003	[-0.39, 0.25]	-0.073
Temporary	52	3.40	0.66						
SB									
Community	45	3.34	0.59	-0.43	78	0.671	.002	[-0.38, 0.24]	-0.066

Institutional	35	3.41	0.80

CI= confidence interval, MD = mean difference, SB= schooling background, *$p < .05$, Sig. (2-tailed)

A series of independent-samples t-test was conducted to compare the mean of perception scores for the series of independent variables; the family occupation, academic qualification, job placement, and schooling background.

There was no significant difference in mean score for agriculture ($M = 3.32$, $SD = 0.60$) and non-agriculture groups ($M = 3.45$, $SD = 0.85$; t (71) = -0.79, $p = .432$, two-tailed). The magnitude of the differences in the means (mean difference = -0.134), 95% *CI:* –0.47 to 0.20) was very small (eta squared = .009). The effect size shows that this variable has less impact on teachers' perceptions on the integration of ethnomathematics because 0.9% of variance of teachers' perceptions on the integration of ethnomathematics is explained by family occupation.

A similar result revealed in mean scores for teacher academic qualification groups: Bachelor (M= 3.45, SD= 0.75) and Master (M=3.32, SD= 0.67); t (70) = 0.78, $p = .440$, two-tailed) and the magnitude of the differences in the means (mean difference = 0.131), 95% *CI:* -0.21 to 0.47) was very small (eta squared = .009). The effect size shows that this variablehas less impact on teachers' perceptions on the integration of ethnomathematics because 0.9% of variance of teachers' perceptions on the integration of ethnomathematics is explained by academic qualification.

Moreover, there was no significant difference in mean score for permanent ($M = 3.32$, $SD = 0.74$) and temporary groups ($M = 3.40$, $SD = 0.66$; t (78) = -0.45, $p = .653$, two-tailed). The magnitude of the differences in the means (mean difference = -.07293), 95% *CI:* -0.39 to 0.25) was very small (eta squared = .003).The effect size shows that this variable has less impact on teachers' perceptions on the integration of ethnomathematics because 0.3% of

variance of teachers' perceptions on the integration of ethnomathematics is explained by job placement.

Likewise, there was no significant difference in mean score for community (M = 3.34, SD = 0.59) and institutional groups (M = 3.41, SD = 0.80; t (78) = -0.43, p = .671, two-tailed). The magnitude of the differences in the means (mean difference = -.06638), 95% *CI:* -0.38 to 0.24) was very small (eta squared = .002). The effect size shows that this variable has less impact on teachers' perceptions on the integration of ethnomathematics because 0.9% of variance of teachers' perceptions on the integration of ethnomathematics is explained by schooling background.

In summary, four research hypotheses were testedto examine the significant difference between groups and all variables revealed no significant difference. Moreover, the effect size of the variables, i.e. family occupation, academic qualification, job placement, and schooling backgroundon teachers' perceptions on the integration of ethnomathematics (using partial eta square)has less impact.

One-Way ANOVA test on perception. The following hypotheses were test using One-Way ANOVA test. These are below.

Null Hypothesis 19. There is no significant difference regarding the teacher perceptions on the integration of ethnomathematics due to age of teacher.

Null Hypothesis 20. There is no significant difference of the teachers' perceptions the integration of ethnomathematics due to experience level.

Null Hypothesis 21. There is no significant difference among the groups of training attendance of the teachers' perceptions on the integration of ethnomathematics.

Null Hypothesis 22. There is no significant difference among the group of graduation faculty of the teachers and their perceptions on the integration of ethnomathematics.

Table 4.12

Descriptive Statistics Results of Variables

Variables		*N*	*M*	*SD*	*SE*	95% *CIM*
Age						
	20-30	24	3.52	0.65	0.13	[3.25, 3.80]
	30-40	33	3.48	0.53	0.09	[3.30, 3.67]
	40 above	22	2.96	0.72	0.15	[2.64, 3.28]
Teaching Experience						
	0-5	18	3.69	0.61	0.14	[3.39, 4.00]
	10-May	21	3.25	0.61	0.13	[2.97, 3.53]
	10+	41	3.29	0.72	0.11	[3.06, 3.52]
Training Attendance						
	Not Yet	20	3.28	0.55	0.12	[3.02, 3.53]
	1-2 times	29	3.53	0.65	0.12	[3.28, 3.77]
	more than 2 times	31	3.28	0.79	0.14	[3.00, 3.57]
Graduated faculty						
	Education	17	3.33	0.69	0.17	[2.98, 3.69]
	Science	45	3.30	0.71	0.11	[3.08, 3.51]
	Others	17	3.56	0.61	0.15	[3.25, 3.88]

The above table depicts the descriptive statistics result of independent variables such as gender, teaching experience, and the training attendance. In gender variable, “20-30” group of teachers highly perceive (M = 3.52, SD = 0.65) and “40 above” group of teachers least perceive (M = 2.96, SD = 0.72) on the integration of ethnomathematics in secondary level.

In teaching experience variable, “0-5” group of teachers highly perceive (M = 3.69, SD = 0.61) and “5-10” group of teachers least perceive (M = 3.25, SD = 0.61) that ethnomathematics isbeing integrated in secondary level.

In training attendance variable, “1-2 times”group of teacher highly perceive (M = 3.53, SD = 0.65),and “not yet” group of teachers (M = 3.28, SD = 0.55) and “more than 2 times” group of teachers least perceive (M = 3.28, SD = 0.79) that ethnomathematics is being integrated in secondary level but “not yet” group of teachersare more consistent about their perceptionson the integration of ethnomathematics.

In graduated faculty variable, “Others” group of teachers highly perceive (M = 3.56, SD = 0.61) and “Science” group of teachers least perceive (M = 3.30, SD = 0.71) that ethnomathematics is being integrated in secondary level.

Table 4.13

Test of Homogeneity of Variances on the Dependent Variable, Perception, with the Independent Variable, Age, Teaching Experience and Training Attendance

Variables	Levene Statistic	*df1*	*df2*	*p*
Age	0.507	2	77	.604
Teaching Experience	0.507	2	77	.604
Training Attendance	1.59	2	77	.211
Graduated Faculty	.761	2	76	.471

*p < .05, Sig. (2-tailed)

Table 4.14

One-Way ANOVA on the Dependent Variable, Perception, with the Independent Variable, Age, Teaching Experience,Training Attendance and Graduated Faculty

Variable		SS	*df*	MS	*F*	*p*	η^2
Age	Between Groups	4.69	2	2.34	5.97	.004	0.14
	Within Groups	29.82	76	0.39			
	Total	34.51	78				
Teaching Experience	Between Groups	2.43	2	1.21	2.69	.075	0.07
	Within Groups	34.77	77	0.45			
	Total	37.2	79				
Training Attendance	Between Groups	1.11	2	0.56	1.18	.311	0.03
	Within Groups	36.09	77	0.47			
	Total	37.2	79				
Graduated Faculty	Between Groups	.90	2	.45	.95	.392	0.03
	Within Groups	35.90	76	.47			
	Total	36.80	78				

Note. SS = sum of squares, MS = mean square, *p < .05, Sig. (2-tailed)

The secondary level mathematics teachers’perceptions on the integration of ethnomathematics are examined regarding age, teaching experiences, training attendance and graduated faculty. One-way between-groups analysis of variance (one-way ANOVA) were conducted on a series of variables to explore the impact of age, teaching experience, training

attendance and graduated faculty on levels of perceptions as measured by the self-administered questionnaire. The participants were divided into three groups according to their age (Group 1: 30yrs or less; Group 2: 30 to 40yrs; Group 3: 40yrs and above); their experience (Group 1: 5yrs or less; Group 2: 5 to 10yrs; Group 3: 10yrs and above); their training attendance (Group 1: Not yet; Group 2: 1 to 2 times; Group 3: more than 2); and their graduated faculty (Group 1: Education; Group 2: Science; Group 3: Others).Preliminary analyses were performed to ensure no violation of the assumptions of normality (see Table 4.5), and homogeneity of variances of age, teaching experience and training attendance (see table 4.13).

One-way ANOVA result revealed that there was no significant difference at the p > .05 level in mean scores for the three experience groups: F (2, 77) = 2.69, p = .075.This manipulation accounted for .07 of the variance in perceptions (usingη^2). This shows that medium impact of teaching experienceon teachers'perceptions onthe integration of ethnomathematics in secondary level.

A similar variance is also observed in relation to the three training groups: F (2, 77) = 1.18, p = .311 and the three graduated faculty groups: F (2, 76) = 0.95, p = .392. This manipulation accounted for .03 of the variances in perceptions (usingη^2). This shows medium impact of training attendance and graduated faculty on teachers' perceptions on the integration of ethnomathematics in secondary level.

But there was a statistically significant difference at the p< .05 level in mean scores of perceptions for the three age groups: F (2, 76) = 5.97, p = .004 and the actual difference in mean scores between the groups was large. The effect size calculated using eta squared, was .14. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for group 3 (M = 2.96, SD = 0.72) was significantly different from group 1 (M = 3.52, SD = 0.65) and group 2 (M = 3.48, SD = 0.53) (see Table 4.15) and means plot of age clearly illustrates that

(see Figure 6).This means age variable has great impact on teachers' perceptions on the integration of ethnomathematics, and "40 above" group of teachers least perceive (M = 2.96, SD = 0.72) than "20-30" group (M = 3.52, SD = 0.65) and "30-40" group (M = 3.48, SD = 0.53) on the integration of ethnomathematics in secondary level.

Table 4.15

Post Hoc Tests: Perceptions on Gender

(I) Age		MD (I-J)	SE	Sig.	95% CI
20-30	30-40	0.04	0.17	.972	[-0.36, 0.44]
	40 above	0.56*	0.18	.009	[0.12, 1.01]
30-40	20-30	-0.04	0.17	.972	[-0.44, 0.36]
	40 above	0.53*	0.17	.009	[0.11, 0.94]
40 above	20-30	-0.56*	0.18	.009	[-1.01, -0.12]
	30-40	-0.53*	0.17	.009	[-0.94, -0.11]

Mean Difference=MD, Std. Error =SE, Confidence Interval =CI

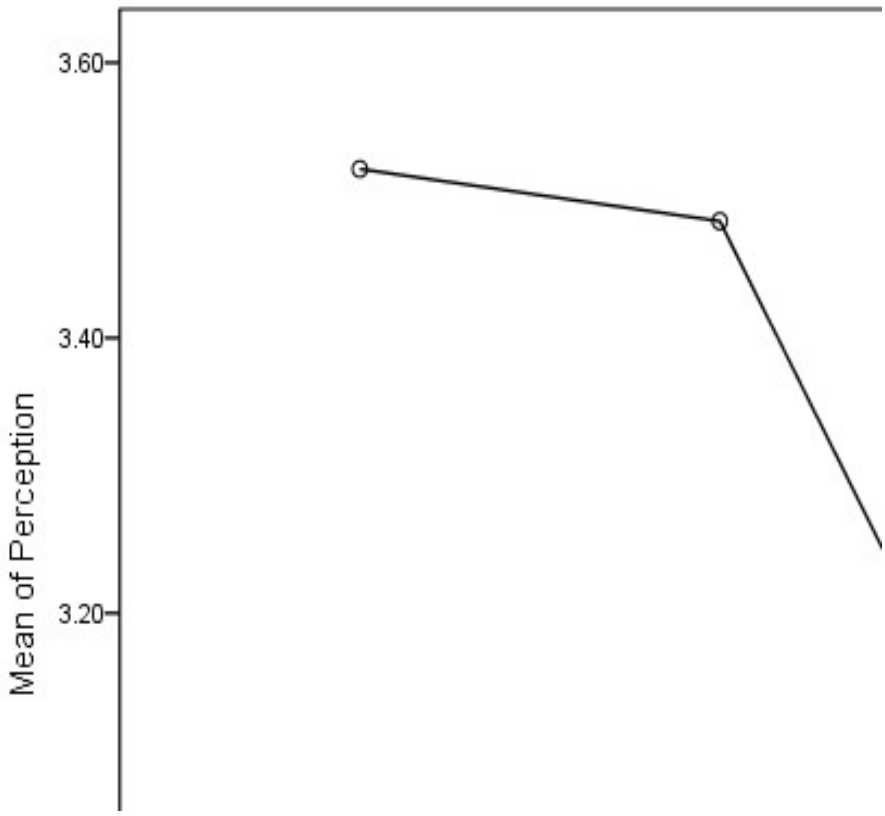


Figure 7. Means Plots of Age

CHAPTER V

SUMMARY, DISCUSSION, AND CONCLUSIONS

Chapter Overview

This chapter includes summary of the study regarding purpose, procedures and findings. Moreover, discussion of the findings focusses on analytical interpretations regarding each research question independently with extensive literature. Likewise, the conclusion of the study is included. It is also concluded by describing the limitations of the study, and the future directions for research. The implications for practice and recommendations for further researchare included at the end of chapter.

Summary of the Study

Integration of ethnomathematics in schooling system is natural process because learners brings their cultural practices in school with them (Adam, 2004). Therefore, it is necessary to encompass students' culture in schooling process to increase ability and achievement of students rather than seeing such diversity as challenge in classroom for learning. But this will be possible if teacherssee such cultural practices as opportunity for teaching and learning because teachers' perceptions play a vital role to encourage teachers to choose effective teaching approach to improve students' achievement within learning process (Baylor & Ritchie, 2002). Therefore, teacher's role as change agent is emphasized. For example, Pant (2015), says that teacher as cornerstonewho shapes vision and mission of education. However, there is dearth of research incorporating teachers' perceptions on theintegration of ethnomathematics and the integration of ethnomathematics through different sources such as curriculum, textbook, classroom process and teacher learning.

The cross-sectional survey studywas conductedin Lalitpur districtto examine the relationship among sources, i.e. curriculum, textbook, classroom process regarding teachers' perceptions on theintegration of ethnomathematics through sources such ascurriculum, textbook, classroom process and teacher learning, and teachers' perceptions on the integration of ethnomathematics according to demographic variables. Twenty-two hypotheses were tested to find out the answer of four research questions. The data was collected usingself-administered questionnairewith strong internal consistency(i.e. 0.93).

The relationship among sources regarding teachers' perceptions on the integration of ethnomathematics shows that there is strong and positive relationship among sources. However, the relationship between textbook and teacher learning reveals that there is moderate and positive relationship(r = 0.46).The findingsshow that teachers' perceptions on the integration of ethnomathematics was at a moderate level (M = 3.37) and the same result reveals regarding teachers'perceptions on the integration of ethnomathematics through different sources namely; curriculum (M = 3.14), textbook (M = 3.23), classroom process (M = 3.60) and teacher learning (M = 3.52). Mann Whitney U test revealed that there was no significant difference between groups of gender, employment status regarding working time and teaching schooling type. The same results also revealed independent sample t-test between groups of family occupation, academic qualification, employment status regarding job placement and schooling type. One-way ANOVA results showthat there was no significant difference among groups of teaching experience and training attendance except age groups and Post-hoc comparisons using the Tukey HSD test indicated that the mean score for " 40 above" group (M = 2.96, SD = 0.72) was significantly different from "20-30" group (M = 3.52, SD = 0.65) and "30-40" group (M = 3.48, SD = 0.53).

Discussion of the Findings

The aim of this section isto provide the in-depth discussion of the findings of research questions on the basis literatureand interpret with unbiased voice. Moreover, basically, each question of this research is discussedindependently to provide strong and rich explanation. In the same way, the sub questions of the study are also considered regarding their own basis. Furthermore, each teacher's characteristics is discussed independently with available literature to provide significant difference among groups of independent variables (teachers' characteristics) used in this study and the summary is discussed.

Research Question One

What are the relationships among sources such as curriculum, textbook, classroom process and teacher learning regarding teachers' perceptions on the integration of ethnomathematics?

Schooling system is an established platform where learners learn basic skills and competencies that make them able to succeed in real life situation. There are four basic components such as curriculum, textbook, classroom process and teacher learning usually intertwined with schooling system to achieve goal effectively. The changes in one component also show the effects on other components. Therefore, there is also strong and positive relationship among four sources regarding teachers' perceptions on the integration of ethnomathematics.

More precisely, classroom process and teacher learning are positively related to each other regarding teachers' perceptions on the integration of ethnomathematicsamong four sources because classroom process is a platform for teacher to learndiverse cultural practices brought by students in classroom throughclassroom discoursewhere academic mathematics envisions different cultural practices (Adam, 2004). In the same way, teacher learning occurs during classroom process because teacherssearch for effective teaching pedagogy to engage

students in classroom,and include such new and interesting ideas in their classroom to teach their students whatever they have learnt as a teacher(Bakkenes et al., 2009). Moreover,whatever teachers learn during learning process,they wish to apply in classroom to reshape the classroom environment and make positive attitude of students about his\her effective role as teacher. Therefore, the result of this study shows the strong and positive relationship between classroom process and teacher learning in regard to teachers' perceptions on the integration of ethnomathematics.

As in teacher learning and classroom process, the findings regarding the relationship between curriculum and textbookalso revealed a significantly strong and positiverelationship because secondary level mathematics textbook, generallyis developedbased on curriculum to fulfil the goal taken by curriculum (CDC, 2007; Duman & Aslan, 2019). "Textbook is an authentic and visible source of curriculum" (Lodhi et al., 2019, p. 27) that aimsto utilize the resources available in their territory (culture and social resources) to make students' capable in basic skills through their cultural and social practices. In the same way, textbook helps to reform curriculum includingrecent cultural and social issues for effective teaching and learning mathematics(Johansson, 2003). Therefore, the relationship between curriculum and textbook are strong and positive regarding teachers' perceptions on the integration of ethnomathematics.In the same way, curriculum also assists teachers in setting their instructional goals and pedagogical implicationsfor classroom process as well as teacher learning to achieve such goal in an effective manner. Therefore, the relationship among such variables should be strong and positive in line of any approach in education system. Therefore, the result of this study also supports with regard to teachers' perceptions on the integration of ethnomathematics in secondary level.

A textbookis taken as a vital element of teaching (Lodhi et al., 2019) that helps teacher to plan and structure their instructional activities (Hirsch et al., as cited in Dingman,

2007) as well as to organize their teaching for effective classroom process (Johansson, 2003).Therefore, the result regarding the relationship between textbook and classroom process is strong and positive. However, it was found that there is moderate and positive correlation between textbook and teacher learningregarding teachers' perceptions on the integration of ethnomathematics because teacher learning is a broad area in comparison to textbook. Therefore, the relationship between textbook and teacher learning is moderate and positive.

In summary, the relationship among four sources, i.e. curriculum, textbook, classroom process and teacher learningregarding teachers' perceptions on the integration of ethnomathematics is strongly positive.Therefore, inclusion of ethnomathematics in schooling system through any sources of integration also helps to include ethnomathematicsthrough other sources in secondary level to make students' cultural mathematics practice significant for them.

Research Question Two

What are the teachers' perceptions on the integration of ethnomathematics in secondary level?

"The general goal of education is the impartment, preservation, and renewal of a culture for those who belong to it"(Dijkstra, 2004, p.148)where secondary level education play a key role to fulfil the goals as well asteachers' perceptions play a vital role to perceive new pedagogy becausetheir belief and knowledge affect their practice (Thompson, 1992)in order to enhance students' understanding by different available materials.Therefore, this is essential to examine teachers' perceptions on the integration of ethnomathematics in secondary level for effective use of ethnomathematics in schooling system. The researcher explored teachers' perceptions in the study and it was found that there are small positive teachers' perceptions on the integration of ethnomathematics. Therefore, the stakeholders

should organize the program, seminar, training in order to inform teachers about integration of ethnomathematics to perceive the positive perception in classroom teaching and learning.

Research Question Three

What are the teachers' perceptions on the integration of ethnomathematics regarding different sources such as curriculum, textbook, classroom process and teacher learning?

As evidenced by the review of literatures, teachers' perceptions have a great impact on curriculum, textbook, classroom process (Cheng, Chan, Tang, & Cheng, 2009; Hand & Treagust, 1994; Tabachnick & Zeichner, 1984) and teacher learning (Taneri, 2010).This study was found that there were positive perceptions of teacherson the sources of the integration such as curriculum, textbook, classroom process and teacher learning. In line of literature, many stakeholders are trying to integrate ethnomathematics in secondary level through curriculum for culturally based mathematics.

Research Question Four

What are the demographic factors that contribute to secondary level mathematics teachers' perceptions on the integration of ethnomathematics?

The demographic factors are those inherent with teachers in the study. There are several demographic factors that influence their perceptions regarding any things. The researcher explored teachers' perceptions on the integration of ethnomathematics in secondary level in this study.

Gender. Gender is a major demographic factor that contributes to influence teachers' perceptionson the issue regarding schooling system because a research carried out by Mutodi and Ngirande (2014) showed that male teachers consistently reported slightly more positive perceptions than female teachers towards the use of concrete materials in constructing mathematical meaning. But, a research study conducted by Aikpitanyi and Eraikhuemen (2017) regarding the use of ethnomathematics to teaching; and by Konokman, Yelken,

Karasolak, and Cesur (2017) regarding curriculum development competencies of teachersshowed that there is no significant difference between gender group and the same result is revealed by this study.Even through, mean ranks of females were higher than of males. For this reason, we can say that the females perceive more positive regarding teachers' perceptions on the integration of ethnomathematics rather than males in secondary level as well as gender has medium impact regarding teachers' perceptions on the integration of ethnomathematics Therefore, it can be conclude that teachers' perceptions on the integration of ethnomathematics isinfluenced by gender.

Age. Age is a key factor that is associated with teaching and learning in education system (Lore, Rut, & Mariana, 2018). A research conducted by Tweed (2013) shows that the age of teacher did not play a significant role in the classroom technology used by teacher. However, the finding of this study revealed that there are significant differences among age groups in regard to teachers' perceptions on the integration of ethnomathematics. It means age groupsof teachersplay a significant role to perceive positive perceptions on the integration of ethnomathematics and the same result was revealed among STE [Science, Technology and Engineering] science teachers' age in over-all EI [Emotional Intelligence]a research conducted by Llego (2017). Moreover, age factor has a huge impact regarding teachers' perceptions on the integration of ethnomathematics in secondary level and more positive perceptions on the integration of ethnomathematics is found among "20-30" age group. Specifically, younger teachers expressed more positive perceptions than their older colleagues. Therefore, the stakeholders should be aware of this factor while selecting teachers for ethnomathematics program in secondary level.

Religion. Due to the small sample size in more than one groups and the large percentage (83.8%) of Hindu mathematics teachers in secondary level, it was not possible to analyse this particular teacher's characteristic within the scope of this research study. The

small number of teachers in this sample may have been associated with the religious majority of country. However, the lack or nonexistence of research in this area regarding the integration of ethnomathematics indicates that more research should be conducted with attention to the religious orientation of teachers, especially since some research studies (Rahman & Wilson, 2003; Peters, Manning, & Reimers, 2007) found statistically significant differences between different religious groupssuch as the mental rotation task (MRT). Therefore, future research should be conducted on religious groups of secondary level using quota sampling or alternate approach to generate a more inclusive sample from different religious groups.

Family occupation. Family occupation shouldhave a huge impact regarding teachers' perceptions on the integration of ethnomathematics because ethnomathematics encompasses the mathematical practices of culture groupsthat provide visual example of mathematics for teaching and learning (D'Ambrosio, 1989). However, this study revealed less impact regrading teachers' perceptions on the integration of ethnomathematics in secondary level in accordance with effect size even through both groups of teachers perceive positive perceptions on the integration of ethnomathematics in secondary level. Moreover, there was no significant difference between the groupsof teacher by their family occupation. Therefore, it can be concluded that the both family occupation groups; agriculture and non-agriculturalperceive the same and positive perceptions on the integration of ethnomathematics in secondary level.

Schooling background. Schooling background of teacherhas great impact on mathematics teaching and learning for teachers because they select the pedagogy for classroom teaching in accordance with what they know and how they learn mathematics asschool students (Zembat & Aslan, 2016). This study shows that the both groups of teachers have mean score greater than natural value. Therefore, teachers' perceptions on the

integration of ethnomathematics have positive and there was no significant difference between schooling background groups; community and institutional schooling background. However, schooling background variable has less impact due to small effect size regrading teachers' perceptions on the integration of ethnomathematics because it may be due to the extensive gap between schooling life and teaching life of teacher. Moreover,the findingsof Siswono et al. (2019) have highlighted that the schooling experience and practice of teacher only influence the belief of teacher about the nature of mathematics. Therefore, they may have possessed positive perceptions on the integration of ethnomathematics in secondary level.

Academic qualification. Academic qualification plays a key role in formal education because academic qualification signifies that they are cable of dealing with problems with achieved skills equivalent to their academic qualification. This study significantly examined the effect of academic qualification regarding teachers' perceptions on the integration of ethnomathematics in secondary level. There were four groups of teachers according to their academic qualification at the beginning. But two academic groups were used in the analysis due to small sample groups of teachers in two groups and other two groups were being eliminated from analysis. Both groups of teachers possess positive perceptions on the integration of ethnomathematics because mean values of group is greater than neutral value.The study found that there is no significant difference between two groups of teachers who have bachelor and master degreeregarding teachers' perceptions onthe integration of ethnomathematics in secondary level. The result is consistent with the findings of Atiyat (2017) regarding psychological burnout due to teachers' academic qualification (i.e. diploma, bachelor of science, and post graduate studies). But the impact of academic qualification is less due to very small effect size regarding teachers' perceptions on the integration of ethnomathematics in secondary level.

Graduated faculty. Each faculty has its own features and it is unique to fulfil the various needs of people and to serve the nation for developmental tasks. However, this study revealed that there was no significant differences in accordance with graduated faculty of teachers regarding teachers' perceptions on the integration of ethnomathematics and the finding is consistent with the findings of Mutodi and Ngirande (2014) regarding teachers'perceptions towards the use of concrete materials in constructing mathematical meaning and the findings ofKonokman, et al. (2017) regarding curriculum development competencies.

Teaching background. By analysing the result of independent sample t-test, it is found that there was no significant difference between teaching background groups; teachers who were teaching community and institutional schools. They perceive the same perceptions on the integration of ethnomathematics in secondary level. The findingsis consistent with the study ofAl-Hothali (2018)on the realization of the importance and practice of the teaching ethics according to teaching place (private and public), and with the study ofAtiyat (2017) in levels of psychological burnoutregarding teaching place (special education, centre, school sub-program) but the place of teaching was different in both context.

Employment status regarding job placement. Job placement holds special place for people to secure their future and to determine their performance for achievement in their working fieldas well. Therefore, job placement should have great impact on schooling system and has significant difference between the groups of job placement.The findings of this study revealthatthe mean value of both groups is greater than neutral and there is no significant difference between job placement groups of teachers so they perceive the same and positive perceptions on the integration of ethnomathematics in secondary level. However, the study shows lessimpact of job placement regrading teachers' perceptions on the integration of ethnomathematics in secondary level in accordance with effect size.

Employment status regarding working status. Teachers perceive positive perceptions due to mean value of groups based on working status regarding teacher perceptions on the integration of ethnomathematics in secondary level. Moreover, this studyalso found that there is no significant difference between teachers according to their employment status as working duration so the both groups of teachers perceive the same and positive perceptions on integration of ethnomathematics in secondary level.

Teaching experience. Teaching experience provides an opportunity for teachers to develop unique teaching strategies from their experience as well as search for new and effective teaching perspective for mathematics teaching. Therefore, this variable has effect regarding teacher perceptions on the integration of ethnomathematics in secondary level. The result of study shows that teachers have positive but less impact regrading teachers' perceptions on the integration of ethnomathematics as well as there are notsignificant differences based on teaching experience. This result is consistent with the findings by Mutodi and Ngirande (2014) which shows that there is no significant difference in their perceptions towards the use of concrete materials in constructing mathematical meaning due to teaching experience and with the findings by Konokman et al. (2017) regarding curriculum development competencies. Likewise, Osman (2014) also found the same result regarding teachers' perception towards WebQuest based on teachers' experience.

Training attendance. Teacher training considerably is related to the professional development and quality of teacher about teaching mathematics effectively. According to Armstrong (2015),the great impact of teacher training can be shown in the performance of teacher in education system and the mean scores of each training attendances groups also have greater than neutral and SD is less than one.For this reason, we can say that eachgroupperceives more positive and consistent perceptions on the integration of ethnomathematics in secondary level.However, this study found that there was no significant

differences among training attendance groups regarding teachers'perceptions on the integration of ethnomathematics in secondary level. This may be evidence that teacher trainer and training organization do not provide any training program that helps them to perceive on the integration of ethnomathematics.

In summary, teachers possess positive perceptions regarding their perceptions on the integration ethnomathematics based on their independent variable because several empirical research studies have been conducted in the context of ethnomathematics (KUSOED, 2008) as well as mathematics is closely related to daily life activities of cultures (Muhafidin, Nurlaelah,& Sudihartinih, 2018). Therefore, they possess similar and positive perceptions on the integration of ethnomathematics. Moreover, these variables show less impact regarding teachers' perceptions on the integration of ethnomathematics except age variable so there are the needs of further research studies in this field.

Implications for Pedagogical Practice

Each and every research has certain purpose beyond academic requirement in order toexamine certain recent issue related to the study field ofresearchers. Fundamental aim to conduct a research is also to make the students capable as an independent researcher who can conduct research.Therefore, each research provides interesting and beneficial sorts of implications for pedagogical practice on behalf ofcommunity and non-government sites. In the same way, this study has also made some implications for government policy and teachers based on the findings.

Implication for Government Policy

Government policy can imply the result of this studyto integrate ethnomathematics in curriculum for effective integration of ethnomathematics in schooling process effectively as well as to integrate ethnomathematics examples in TPD, i.e. workshop, training program, teacher, seminar, etc.because of significant relationship among classroom process and teacher

learning; curriculum and textbook.Likewise, the government sites can use the result to facilitate different types of programs related to ethnomathematics in schools' level that encourage teachers and students to see relevant mathematical practices around their territory. In the same way, the government policy can encourage researchers to conduct further research studies in this area through her agencies as well as provide most sorts of training in our context because teachers are interested in using cultural examples for effective classroom discourse.Moreover, the government agencies can suggest textbooks' authors to develop textbook in accordance with ethnomathematics perspective that helps teachers and students to give the space of their cultural mathematical practices. The government agencies can be sensitized to use existing integrated ethnomathematics in teaching and learning. Furthermore, the study implies that young teachers can play a significant role to use cultural mathematics. The government policy can use this finding regarding teachers' perceptions on the integration of ethnomathematics to improve professional development practices in other districts of Nepal or in similar international contexts.

Implication for Teachers

Based on the findings, the following implications are made for teachers. Teachers can be aware of students' culture in order to utilize ethnomathematical practices around their teaching territory. They have to embark on integrating ethnomathematics of their students in classroom as pedagogical tools for teaching mathematics. Moreover, teacherscan use their time to participate in professional development programs such as workshop, seminar, training, etc. regarding the integration of ethnomathematics.Moreover, teacher canallocate more time to collaborate other teachers for the planning and providing professional support for the integration of ethnomathematics.

Conclusion

Based on the findings of the study, it is concluded that curriculum, textbook, classroom process and teacher learning are great sources that help to integrate ethnomathematics in secondary level as well as these sources are also related to each other in such a way the diverse mathematical practices are duly integrated into schooling system. Therefore, such diverse ethnomathematics can be used as teaching and learning pedagogy to teach academic mathematics and establish rich conceptual understanding through students' own cultural examples to resolve fundamental problems in mathematics learning permanently. This study empirically investigated that teachers' perceptions as a whole seem positiveas well as young teachers also possesses positive perceptions regarding teachers' perceptions on the integration of ethnomathematics. Moreover, teachers' perceptions are positive on the integration of ethnomathematics through different sources such as curriculum, textbook, classroom process and teacher learning.

Recommendations for Further Research

Based on the findings of the study and above discussions, the following recommendations are made:

From the findings,the researcher recommends that the research studies in each sourcemay be more appropriate because of the broad spectrum of integration sources, i.e. curriculum, textbook, classroom process and teacher learning, etc.used in the study as well as each sourceused in this study has their own significance and features regarding teachers' perceptions on the integration of ethnomathematics. In addition, research studies in the field of ethnomathematics using ethnographic may be seen as more applicable to address integrated ethnomathematics and their impact on academic learning. Therefore, the researcher recommends that other alternative methodology may be good to study teachers' perceptions on the integration of ethnomathematics. Moreover, this study is also new in relation to sample

size, sampling procedure, data analysis, etc. Therefore, the researcher recommends that interested researcher may extend sample size and choose other sampling procedures and data analysis tools.

In the context of instrument, the researcher used self-administered survey questionnaire that was simplyrefined on the basis ofpiloting data with forty mathematics teachers. Therefore, the researcher recommends that instrument used in this study has to be valid in inclusive setting or, run other statistical tool to increase reliability and validity of instrument. Furthermore, the researcher also recommends todevelop their own instruments or use valid instruments that are tested by high quality research site in this area for effective results.

Besides the above recommendations for further research, the following research topics for further research recommendations are also made; challenges for mathematics teacher in multicultural classroom: A case study,multicultural modelling for inclusion of diverse ethnomathematics in schooling system,ethno-modelling as a tools for academic mathematics: Ethnographic study of particular culture, and impact of integrated ethnomathematicson multicultural classroom for mathematics teaching and learning etc.

Limitations of the Study

In academic research, the research is basically conducted to fulfil the requirement than produce high quality of research because of limited time and resources. Therefore, that leads to the limitations of any research regardingvarious aspects of research such as problem context, research questions, methodology, population, study sample, instrument, a way of conducting field data collection, analysis and reporting data, etc. As a result, the researcherhasalso expected that this study has its own limitations.

This study was conducted to fulfil the academic requirement without any fund in order to complete in certain time and context as well as the researcher could not study more

about particular geographical area, culture, nature of population and location of the research closely and conducted this research in unfamiliar settingdue to the constraint of time and level of research. Hence, these can be taken as limitations of this research as well.

The field of ethnomathematics is always seen in relation to ethnographic design as more appropriate to take out significant results from conducted research. However, this research adapted cross-sectional research to serve the interest of the research. Therefore, the research design may be also as limitation.Furthermore, in survey research, simplerandom sampling is taken as most appropriate sampling procedure to collect data from the field but the researcher took convenience sampling to collect data and it is also assumed as simple random sampling in unknown population and context with the small size of sample. However, this procedure could not represent full essence of randomization of sample. So, it was also a limitation of this research.

As a naïve researcher, the researcher developed a self-administered instrument to examine teachers' perceptions on the integration of ethnomathematics.There may be chances to increase second type error. Therefore, it was also limitation of this research. Moreover, the findings of this study are presented based on self-administered survey questionnaire and data was analysed by the researcher himself.

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APPENDIX A: PILOTING DRAFT OF QUESTIONNAIRE

"माध्यमिकतहमास्थानीयगणितकोएकीकरणकोबारेमाशिक्षकहरुकोधारणा" सम्बन्धीप्रश्नावलीहरु

QUESTIONNAIRE OF TEACHERS' PERCEPTION OF INTEGRATION OF ETHNOMATHEMATICS IN SECONDARY LEVEL

आदरणीयगणित शिक्षक,

गणितशिक्षकभएकोहुनालेतपाईलाईस्थानीयस्तरमाप्रयोगहुनेगणितकोबारेमाअवगतछहोला, जुनतपाईप्रत्यक्षवाअप्रत्यक्षरूपमाकक्षाकोठामाप्रयोगगरिरहनुभएकोछ। यसकोबारेमाअध्ययनगर्नसकियोभने, यसलेशिक्षककोपेशागतविकास, विद्यार्थीहरुकोबुझाइसुधार्नुकासाथ-साथैउनीहरूकोउपलब्धिपनिसुधारगर्नमहत्वपूर्णभूमिकाखेल्नसक्छ। त्यसैले, योसर्वेक्षणमातपाईकोप्रतिक्रियाआवश्यकदेखिन्छ।

ममाध्यमिकतहमाशिक्षणगर्नेगणितशिक्षकहरूको "माध्यमिकतहमास्थानीयगणितकोएकीकरणकोबारेमाशिक्षकहरूकोधारणा" केछरकुन-कुनतत्वहरूलेयसकोएकीकरणमायोग्दानपुर्याइरहेकोछ।

मेरोअध्ययनक्षेत्रमहोत्तरीजिल्लाभएकोलेयोजिल्लामामाध्यमिकतहमाशिक्षणगर्नेगणितशिक्षकहरूमेरोअध्ययनजनसङ्ख्याछ।

योसर्वेक्षणमातपाईकोसहभागिताएकप्रतिकृयादाताउत्तरदाताकोरुपमाछ। योअध्ययनमातपाईकोव्यक्तिगतजानकारीरप्रतिकृयागोपनियतारअज्ञाततकासाथनिश्चितगरीराख्नुकासाथैपहिचाननहुनेगरीसान्केतिकरण (कोडिङ) गरीराखिनेछजसलेगर्दाभविष्यमातपाईहरूलाईकुनैप्रकारकोवाधापर्नेछैन। कृपयाध्यानराख्नुहोस्, योतथ्याङ्क(आन्कडा) यसअध्ययनकोलागिमात्रप्रयोगगरिनेछ।

योसर्वेक्षणमासहभागीभईआफ्नोअमूल्यप्रतिकृयादिनुभएकोलेमतपाईलाईहृदयदेखिआभारप्रकटगर्छु। योसर्वेक्षणकोप्रश्नावलीपुरागर्न२देखि३घण्टालग्नेछ। कृपयायोसर्वेक्षणफारम२४घण्टापुरागरीउक्तफारमलाईपुन: खाममाहालेरविद्यालयमा राखीदिनुहुनअनुरोधगर्दछु। यसमासमावेशभएकाप्रश्नहरुविद्यालयप्रक्रियाकोपाँचओटाक्षेत्रसमेटिनेगरितयारगरिएकोछ। जुननिम्नानुसाररहेकाछन्।

(1) पाठ्यक्रम (2) पाठ्यपुस्तक (3) कक्षाकोठाप्रक्रिया (4) शिक्षकहरुकोमुल्यांकनप्रक्रियामा (5) शिक्षकसिकाई

निवेदक
नाम:- सुरेन्द्र कुमार ठाकुर
तह:-स्नाकोत्तर (Master),
विश्वविद्यालय:- काठमान्डौ विश्वविद्यालय,
स्कूल अफ इजुकेशन हात्तिवन, ललितपुर
❄❄कृपया अर्को पृष्ठ (पना) पल्टानुहोस्❄❄

कृपयातलदिइएकाखालीठाउँमासहीजानकारीभर्नुहोस्रकोठाहरुमा सहीजानकारीभएको कोठामा (✓) लगाउनुहोस्।

1. **नाम:-** ---------- ---------- ----------
   पहिलो बिचको अन्तिम
2. **लिङ्ग:-** पुरुष ☐ महिला ☐ **3. उमेर:**--------- वर्ष **4. जात:-** ---------- **5. धर्म:-** ----------
6. **पारिवारीकपेशा:-** ---------- **7. अध्ययनगरेकोविद्यालयकोप्रकार:-** सरकारीनिज ☐ ☐
8. **अस्थायीठेगाना :-** वार्डन.-------- नगरपालिका----------जिल्ला----------अञ्चल----------
9. **स्थायीठेगाना:-** वार्डन.--------नगरपालिका----------जिल्ला----------अञ्चल-------
10. **मोबाईलनम्बर:-** ☐ **11. ईमेल Id:-** ☐
12. **शिक्षण गरिरहेकोविद्यालयकोनाम:-** ----------
13. **शिक्षण गरिरहेकोविद्यालयकोठेगाना:-** ----------
14. **शिक्षण गरिरहेकोविद्यालयकोप्रकार:** सरकारीनि ☐ **15 क्षिकयोग्यता:-** ----------
16. **म**स्थायीअ ☐ **ीशिक्षक** ☐ **17.** Part-TimeFull-Time ☐ **ाउनेशिक्षक** ☐
18. **संकाय:** शिक्षाि ☐ व्यवस्थाप ☐ भए (नामलेख ☐):----------
19. **तपाईलेशिक्षणपेशाशुरुगरेकोकतिबर्षभयो ?** 0 देखि 1 ☐ खि 5 ☐ खि 10 ☐
    10 भन्दामाथि ☐
20. **केतपाईलेकुनैशिक्षकप्रशिक्षणकार्यक्रममा (TPD) सहभागीहुनुभएको छ?** हो ☐ ☐
    होइन**यदिहोभनेकतिपटकसहभागीहुनुभएकोछ?** ☐ क 2 ☐ क ☐ क
    3 पटकभन्दाबढी ☐

यस प्रश्नावलीमा आवश्यक शब्दहरुको परिभाषा सुची पनि समावेश गरिएको छ, जुन निम्नानुसार रहेका छन्।

संस्कृति:- कुनै राष्ट्रको वा जातिको सामाजिक जीवन अर्थव्यवस्था आदिमा प्रतिबिम्बित हुने र तिनका कलाकौशल बौद्धिक विकास आदिमा प्रकट हुने र तिनका क्रियाकलापको परिस्कृत रुप

सांस्कृतिकअनुभवहरु:- व्यक्तिले आफ्ना संस्कृतिमा बिताएका पलहरु, क्षणहरुको समष्टिगत रुप

सांस्कृतिक गणित:- संस्कृतिमा पाइने गणित

सांस्कृतिक प्रतिभा:- सांस्कृतिक ज्ञानले कुनै काम गर्न योग्य भएका

सांस्कृतिक क्रियाकलाप:- साझा उद्देश्यहरु लिई एक ठाउँमा भेला भएका व्यक्तिहरुले गर्ने क्रियाकलाप

विद्यार्थीहरुको संस्कृति:- बिद्यालयमा भएका विद्यार्थीहरुको संस्कृति

संस्कृतिसापेक्ष:- संस्कृतिको मर्मलाई बुझ्नेगरी गरिने कार्य

❄❄ कृपया अर्को पृष्ठ (पना) पल्टानुहोस् ❄❄

माध्यमिकतहमाशिक्षणगर्नेशिक्षकहरुको"स्थानीयगणितकोएकीकरणको (INTEGRATION OF ETHNOMATHEMATICS)बारेमाशिक्षककोधारणा" सम्बन्धीप्रश्नावलीहरु

कृपयाप्रत्येककथनलाईध्यानपूर्वकपढीत्यसकोबारेमातपाईआफनोप्रतिक्रियालाईपाँचओटाकोठामध्येतपाईपूर्णरुपले सहमतभएकोकोठामा (✓) लगाउनुहोस् ।

पू.स. – पूर्णसहमत, स. – सहमत, त. – तटस्थ, अ. - असहमत, पू. अ. - पूर्णअसहमत

सि. न.	प्रश्नहरु	पू. स.	स.	त.	अ.	पू. अ.
	पाठ्यक्रम					
उद्देश्य						
1	गणित पाठ्यक्रममा उल्लेखितउद्देश्यहरु दैनिक जीवनमा आइपर्ने समस्याहरु प्रतिलक्षितछन् ।					
2	गणित पाठ्यक्रमका उद्देश्यहरु स्थानीय ज्ञानरसीपलाई जोड्ने गरी निर्धारण गरिएको छ ।					
3	पाठ्यक्रममा उल्लेख भएका उद्देश्यहरु स्थानीय वस्तुहरु, जस्तैः- ईटा, वोतल, काठकाठोससामग्री आदिको प्रयोग गरी प्राप्त गर्न सकिने बनाइएको छ ।					
4	पाठ्यक्रमले प्रत्येक व्यक्तिको सांस्कृतिकअनुभवहरु समेटिने गरी उद्देश्य निर्धारण गरेको छ ।					
5	गणित पाठ्यक्रमको मुख्य उद्देश्यहरु मध्ये स्थानीय गणितलाई एकिकृत गर्नु हो भन्ने देखिन्छ ।					
विषयवस्तु						
6	गणित पाठ्यक्रमको विषयवस्तु स्थानीय सन्दर्भसंग मेल खाने गरी छानिएका छन् ।					
7	गणित पाठ्यक्रममा समावेश भएका विषयवस्तुहरु स्थानीय समाज सापेक्ष छन् ।					
8	गणित पाठ्यक्रममा समावेश भएका विषयवस्तुहरु विभिन्न समुदायका गणितीय धारणालाई एकिकृत गरी विद्यालय गाणितका रुपमा स्वीकारेको पाइन्छ ।					
9	गणित पाठ्यक्रमका विषयवस्तु वास्तविक सांस्कृतिक अनुभवहरुका आधारमा तयार पारिएका छन् ।					
शिक्षणसामग्रीहरु						
10	गणित पाठ्यक्रमले स्थानीय स्तरमा उपलब्ध हुने शिक्षण सामग्रीहरु प्रयोग गर्नसक्नेवातावरणशिक्षकलाईबनाईदिएकोछ ।					
11	पाठ्यक्रमलेस्थानीयस्रोतसाधनहरुकोउचितप्रयोगकालागिशिक्षकहरुकोस्रोतसामग्रीहरुमा स्थानीयगणितकोबारेमाविस्तृतजानकारीदिएकोछ।					
12	पाठ्यक्रमकोस्रोतसामग्रीमासांस्कृतिकगणितकोजानकारीबाटविषयवस्तुकोउठानगरेकोपाइन्छ ।					
13	प्रत्येक शिक्षकलाई स्वतन्त्रपूर्वक स्थानीय रुपमा पाइने सामग्रीहरु छनौट गर्न सक्ने कुरा पाठ्यक्रमले स्वीकारेको छ ।					
शिक्षणविधिहरु						

14	पाठ्यक्रममा समावेश भएका विधिहरुको प्रयोग गरी गणितलाई समाजसंग नजिक बनाउन सकिन्छ, जस्तै:- परियोजनाविधिआदि।					
15	पाठ्यक्रममा उल्लेख शिक्षण विधिहरु दैनिक जीवनसंग मेल खाने खालका छन्, जस्तै:- भ्रमणविधि, खेलविधिआदि।					
16	पाठ्यक्रमले तोकेको गणित शिक्षण विधिहरु स्थानीय समुदायमा पाउने धारणाहरुको बारेमा जानकारी गराउन मद्दत गर्ने खालका छन्।					
17	पाठ्यक्रममा उल्लेखित शिक्षण विधिहरु प्रयोग गरी शिक्षकले स्थानीय गणितीय धारणाहरुलाई विद्यार्थी र समुदाय सामु ल्याउन सक्छन्।					
18	पाठ्यक्रममा उल्लेखित शिक्षण विधिहरुको प्रयोग गरी व्यक्तिको सांस्कृतिक प्रतिभा उजागर गर्न सकिन्छ।					
मुल्यांकन						
19	पाठयक्रममा उल्लेखित मुल्यांकनको साधनको प्रयोग गरी समूदायमा प्रयोग भइरहेको गणितीय धारणालाई व्यवस्थित तरिकाले प्रयोग गर्न सकिन्छ।					
20	पाठयक्रममा उल्लेखित मुल्यांकनको साधनको प्रयोग गरी स्थानीय गणितीय विषयवस्तुको प्रयोग बारेमा मुल्यांकन गर्न सकिन्छ।					
21	पाठयक्रममा उल्लेखित मुल्यांकनको साधनको प्रयोग गरी स्थानीय सामग्रीहरुको प्रयोग बारेमा मुल्यांकन गर्न सकिन्छ।					
22	स्थानीय चाडपर्वमा प्रयोग हुने गणितीय क्रियाकलापलाई मुल्यांकनको रुपमा स्वीकार्ने वातावरण यो पाठ्यक्रमले दिएको छ।					
23	पाठ्यक्रमलेसिकाइलाईदैनिकजीवनमाउपयोगगर्नेखालेबनाउनकोलागिस्पष्टनिर्देशनदिएको पाइन्छ।					
24	पाठ्यक्रमलेराखेकाराष्ट्रियउदेश्यहरुप्राप्तगर्नस्थानीयगणितलाईकक्षाकोठामाजोड्नुपर्छभने अप्रत्यक्षरुपमानिर्देशनदिएकोपाइन्छ।					
25	मुल्यांकनलाई पाठ्यक्रमले खुला रुप दिएकोपाइन्छ ताकि समाजमा सापेक्षित गणित खोज्न सकियोस्।					
अन्यतत्वहरु						
26	गणित पाठ्यक्रमलेविद्यालय गणितलाई स्थानीय र सान्दर्भिक बनाउन जोड दिएको पाइन्छ।					
27	म अहिलेको पाठ्यक्रमको सहयतालेविद्यालय गणितलाई सान्दर्भिक बनाउन सक्छु।					
28	गणित पाठ्यक्रमले विद्यार्थीहरुको संस्कृतिलाई सिकाइ स्रोतको रुपमा स्वीकारेको पाइन्छ।					
29	मैले पाठ्यक्रम पढेर (गाउँघरमा) स्थानीय स्तरमा पाइने गणितिय विषयवस्तु उदाहरणको रुपमा प्रयोग गरिरहेको छु।					
30	पाठ्यक्रममा स्थानीय गणितको धारणालाई आधार बनाएर पढाउन जोड दिइएको छ।					
31	पाठ्यक्रममा शिक्षण रणनीतिहरु स्थानीय सांस्कृतिसापेक्ष समावेश गरेकोपाइन्छ।					
32	गाउँघरतिर पाइने गणितको प्रयोगतिर पाठ्यक्रमले जोड दिएको पाइन्छ।					
33	पाठ्यक्रममा स्थानीयस्तरमा पाइने गणितीय उदाहरणहरुको प्रयोग बढाउदै लागिएको देखिन्छ।					
34	गणित पाठ्यक्रमले सांस्कृतिक उदाहरणहरुको प्रयोग नै गणित शिक्षणको उपयुक्त तरिका छन्।					
पाठ्यपुस्तक						
परिचय						

35	गणित पाठ्यपुस्तककोअधिकान्श एकाइमा भएको पुनरावलोकन दैनिक जीवनमा आधारित उदाहरण दिइ प्रष्ट पारिएका छन्।					
36	गणित पाठ्यपुस्तकको प्रत्येक एकाइको परिचयमा स्थानीय उदाहरणहरु समावेश भएको पाइन्छ।					
37	गणित पाठ्यपुस्तकमाप्रस्तुत परिभाषाहरु स्थानीयसापेक्ष हुने गरी धारणाहरु प्रष्ट परिएका छन्।					
38	गणित पाठ्यपुस्तकमा उल्लेखित परिभाषाहरुमा दैनिक जीवनमा पाइने शब्द र शब्दावलीको प्रयोग गरेको पाइन्छ।					
39	गणित पाठ्यपुस्तकमा पाइने धारणाहरुको परिभाषामा सांस्कृतिक शब्दावलीको प्रयोग गरी परिभाषित गरिएका छन्।					
उदाहरणहरु						
40	गणित पाठ्यपुस्तकमाप्रस्तुत उदाहरणहरुले समुदायमा पाइने गणितीय धारणालाई प्रष्ट पार्छ।					
41	गणित पाठ्यपुस्तकमाप्रस्तुत उदाहरणहरुको मदतले समुदायमा पाइने विभिन्न कार्यहरु सहज तरिकाले बुझ्न मद्दत गर्छ।					
42	गणित पाठ्यपुस्तकमाप्रस्तुत साध्यहरुको प्रयोग स्थानीय समाजमा कहाँ-कहाँ हुन्छ भनी छलफल चलाउन सकिने आधार तयार गरेको छ।					
43	गणित पाठ्यपुस्तकमाप्रस्तुत प्रमाणहरु स्थानीय उदाहरणहरु सहित प्रष्ट परिएका छन्					
44	गणित पाठ्यपुस्तकमाप्रस्तुत गणितीय तथ्यहरु स्थानीय स्तरमा (दैनिक जीवनमा) प्रयोग हुने तथ्यहरुसंग मेल खाने खालका छन्।					
45	गणित पाठ्यपुस्तकमाप्रस्तुत प्रमाणमा प्रयोग हुने तर्कहरु (Reasonings) समाजमा दिने तर्कहरु (Reasonings) जस्तै प्रयोग भएको पाइन्छ।					
46	गणित पाठ्यपुस्तकमा प्रयोग हुने शब्दावली सांस्कृतिक अर्थ झल्किने गरी अर्थ उल्लेख गरिएको छ।					
दृष्टान्तहरु						
47	गणित पाठ्यपुस्तकमा भएका दृष्टान्तहरु सान्दर्भिक छन्, जस्तै:- घरजग्गासम्बन्धीकरोबारकोतस्वीरअथवायस्तैआदि।					
48	गणित पाठ्यपुस्तकमा भएका दृष्टान्तहरु स्थानीय गणितीय धारणाहरुलाई स्पष्ट रुपमा झल्काइ रहेकोपाइन्छ,जस्तै:- खेतमाकामगरिरहेकोतस्वीर, किनवेचकोतस्वीरआदि।					
49	गणित पाठ्यपुस्तकमा भएका दृष्टान्तहरु (Illustrations) सांस्कृतिक छन्,जस्तै:- पिरामिडमा पिङ्गकोतस्वीर।					
50	गणित पाठ्यपुस्तककोअभ्यासहरुमास्थानीयगणितीयक्रियाकलापहरुलाईप्रश्नकोरुपमाप्रस्तुतगरेकाछन्, जस्तै:- समूहसम्बन्धीशाब्दिकसमस्याहरुअथवायस्तैआदि।					
कक्षाकोठाप्रक्रियामा						
51	गणितको कक्षाकोठा प्रक्रियामा छलफललाई आधार बनाउँछु किनभने यसले एकअर्काको सांस्कृतिक क्रियाकलाप आदानप्रदान गर्न मदत गर्छ।					
52	म कक्षाकोठामा गणित शिक्षण गर्दा परिभाषाहरुमा स्थानीय शब्दको प्रयोग गर्छु।					
53	म कक्षाकोठामा गणित शिक्षण गर्दा स्थानीय उदाहरणहरुको प्रयोग गर्छु।					
54	म कक्षाकोठामा समाजमा पाइने दृष्टान्तहरु प्रस्तुत गर्छु,जस्तैमा, पिरामिडकोधारणाकोलागिमन्दिरकोछाउनी (गोफा) आदि।					
55	म विद्दयार्थीहरुलाई प्रत्येक एकाइको शुरुमा विद्दयार्थीहरुसंग सम्बन्धित धारणाको बारेमा स्थानीय गणितीय अनुभवहरुलाई कक्षाकोठामा आदानप्रदान गर्न प्रेरित गर्छु।					
56	मविद्दयार्थीहरुलाईप्रत्येकएकाइकोशुरुमाउनीहरुसंगसम्बन्धितधारणाकोबारेमास्थानीयगणितीयअनुभवहरुलाईकक्षाकोठामाआदानप्रदानगर्नप्रेरितगर्छु।					

57	मविद्यार्थीहरुलाईसमय-समयमाएक्लैवासमूहविभाजनगरीसमुदायकोभ्रमणगर्नलगाउँछु ।					
58	विद्यार्थीलेभ्रमणबाटप्राप्तगरेकोअनुभवहरुलाईसमूहमाछलफलगर्नलगाउँछु ।					
59	विद्यार्थीहरुकोछलफलबाटनिस्केकोनिष्कर्षलाईकक्षाकोठामाप्रस्तुतगर्नलगाउँछु ।					
60	विद्यार्थीहरुलाईप्राप्तनिष्कर्षकोबारेमाअन्यसमूहहरुलाईआफ्नातर्कप्रस्तुतगर्नलगाउँछु ।					
61	मप्रत्येकएकाइकोअन्त्यमाधारणासंगसम्बन्धितस्थानीयसन्दर्भजोड्नसिकाइक्रियाकलापगराउँछु ।					
62	मकक्षाकोठामाविद्यार्थीहरुलाईधारणासंगसम्बन्धितदृष्टान्तदिईप्रष्टपार्छु । (जस्तै:- खेतनाप्रेमान्छेलेगर्नेगणितीयकार्यकोतस्विरवायस्तै)					
63	मकक्षाकोठामासमूहबनाउदामिस्रित (Heterogenious) समूहबनाउछु । (जस्तै:- विभिन्नसमूदायकाकेटाकेटीवाविद्यार्थीहरुसमेटिनेगरी)					
64	प्रत्येकसमूहलाईछलफलगर्नलगाउदाप्रत्येकविद्यार्थीहरुकोसाँस्कृतिकउदाहरणहरुआउनेगरीसमूहलाईनिष्कर्षनिकाल्नलगाउँछु ।					
65	समूहमाहुनेछलफललाईस्थानीयकरणकसरीगर्नसकिन्छभनेविषयकोलागिविभिन्नशिर्षकमाछलफलगर्नलगाउँछु ।					
66	मस्थानीयस्तरमाकामलाग्नेप्रयोगात्मककार्यगराउनतिरजोडदिन्छु । जस्तै:- कार्टुनमाकतिओटासावुनवाबिस्कुटकसरी, कतिअनुपातकोरकसरीबढीअटाउनसकिन्छ ।					
67	मकक्षामा ।CT कोप्रयोगगरीसुक्ष्मस्थानीयगणितीयअवधारणालाईविद्यार्थीसामूप्रस्तुतगर्छु ।					
68	मविभिन्नस्थानीयगणितीयधारणाकोबारेमाजानकारीदिनेलेख, भिडियोहरुरतस्वीरहरुआदिकक्षामाप्रस्तुतगर्छु ।					
69	ममुल्यांकनकोलागिविद्यार्थीहरुलाईस्थानीयसन्दर्भमिल्नेप्रयोगात्मककार्यदिन्छु ।					
70	मगृहकार्यमासमाजमापाइनेउदाहरणहरुखोजेरल्याउनेकार्यदिन्छु ।					
71	मविद्यार्थीहरुलाइपाठ्यपुस्तकमाभएकोअभ्यासहरुकाप्रश्नहरुलाईस्थानीयस्तरमाउपयुक्तहुनेक्रियाकलापसंगजोडेरल्याउनेकार्यगृहकार्यकोरुपमादिन्छु ।					
72	मविद्यार्थीहरुलाईगृहकार्यमासमाजमाभएकागणितीयक्रियाकलापलाईकक्षाकोठामाल्याउनेकार्यदिन्छु ।					
73	मविद्यार्थीहरुलाईस्थानीयगणितीयअनुभवआउनेगरीलेख्रेकुरागृहकार्यमादिन्छु ।					
74	मविद्यार्थीहरुलाईस्थानीयपरिवेशसंगमेलखानेपरियोजनाकार्यगृहकार्यमादिन्छु ।					
75	मविद्यार्थीहरुकोसांस्कृतिमापाइनेगणितलाईगीतकोरुपदिनेकार्यगृहकार्यकोरुपमादिन्छु. जस्तै:- छठपर्वकोगीतमागणितमापरिणतगरिसुनाउनलगाउनेआदि ।					
76	मविद्यार्थीहरुलाईसमाजमाभएकागणितीयधारणालाईरमाइलोहुनेस्थानीयक्रियाकलापमाढालेरल्याउनेकार्यगृहकार्यमादिन्छु ।					
77	मविद्यार्थीहरुलाईसान्दर्भिकप्रश्नहरुनिर्माणगर्नेकार्यगृहकार्यकोरुपमादिन्छु ।					
78	मविद्यार्थीहरुलाईउनीहरुकोसांस्कृतिमाविभिन्नपरिकारनिर्माणमाप्रयोगहुनेधारणाकोवारेमाखोजगर्नेकार्यगृहकार्यकोरुपमादिन्छु ।					
79	मविद्यार्थीहरुकोसांस्कृतिमाप्रयोगभइरहेकोगणितीयधारणाकोबारेमाखोजगर्नेकार्यगृहकार्यकोरुपमादिन्छु ।					
80	मविद्यार्थीहरुलाईपढाएकोविषयवस्तुदैनिकजीवनमाप्रयोगगरेरउदाहरणप्रस्तुतगर्नलगाउँछु ।					
81	मविद्यार्थीहरुकोउपलब्धिपरीक्षामास्थानीयउत्तरआउनेप्रश्नपत्रनिर्माणगर्छु ।					

82	मविद्यार्थीहरुलाईउनीहरुकोस्थानीयमौलिकउत्तरहरुलाईग्राह्यतादिन्छु।					
83	मशिक्षकनिर्मितपरीक्षामास्थानीयउत्तरआउनेखुल्लाप्रश्ननिर्माणगर्छु।					
84	मशिक्षकनिर्मितपरीक्षामाविद्यार्थीहरुकोसांस्कृतिकगणितीयउदाहरणआउनेप्रश्नहरुनिर्माण गर्छु।					
85	स्तरीयकृतपरीक्षाकोलागिप्रश्नहरुनिर्माणगर्नुपर्दाविद्यार्थीहरुकोसांस्कृतिकगणितीयअवधार णाकोउपयोगआउनेगरीनिर्माणगर्छु।					
	शिक्षकसिकाई					
86	कक्षाकोठामामविद्यार्थीहरुकोसांस्कृतिमापाइनेउदाहरणहरुसिक्नेमौकापाउँछु। जस्तै:- गोलाकोउदाहरणमा: मैथिलीसांस्कृतिमाभुसुवा रथारुसमूदायमाभुजा,चिउरारतिलकोलड्डुआदि।					
87	कक्षाकोठामास्थानीयगणितीयउदाहरणहरुसिक्नेमौकापाउँछ। जस्तै:- वेलनाआकारवस्तुमा; ग्याँससिलिन्डर, मुरलीरहेम्पाइपआदि।					
88	सहकर्मीहरुबाटउत्प्रेरितभईगणितीयविषयवस्तुशिक्षणलाईस्थानीयविषयवस्तुसंगजोड्नमन पराउँछु।					
89	सुपरिवेक्षकलेगणितलाईउपयोगीबनाउनविद्यार्थीहरुकोसांस्कृतिमापाइनेगणितलाईविद्या लयगणितसंगजोडेरलाग्नुपर्छभन्नेसल्लाहदिनुहुन्छ।					
90	स्थानीयगणितीयधारणालाईविद्यालय गणितमाल्याउनेउपायकोबारेमाविभिन्नपक्षसंगछलफलगरीनिष्कर्षलाईउपयोगमाल्याउँछु।					
91	शिक्षकपेशागतविकासकार्यक्रममागणितीयधारणाहरुलाईस्थानियगणितीयविषयवस्तुसंगजो डदिनेकुराहुन्छ, जस्तै:- स्थानियस्तरकोक्षेत्रफलनिकाल्नेतरिकालाईजोडदिनु ।					
92	समाजमापाइनेगणितीयधारणाहरुकोबारेमासमाजकावुद्दिजिवीहरुसंगछलफलगरीविस्तृत जानकारीलिन्छु,जस्तै:- गाउँघरमाजोड्नेव्याजकाबारेमावायस्तै।					
93	समाजमापाइनेगणितीयधारणाहरुकोस्थानीयप्रयोगमामनिरन्तरअध्ययनगर्छु। जस्तै:- इनारहरुकोआकार, धानदौनिमाप्रयोगहुनेवृतकोधारणाकोप्रयोगआदि।					
94	मगणितीज्ञहरुसंग (मौकापारी) समय- समयमास्थानीयगणितलाईविद्यालयमाल्याउनेविषयमाछलफलगर्छु।					
95	शिक्षकस्रोतसामग्रीहरुपढ्दामलाईविभिन्नस्थानीयगणितियकृयाकलापकोबारेमाजानकारीपा उँछु, जस्तै:- गणितियकथन, मान्यतर्कआदि।					
96	कक्षाकोठामागणितीयविषयवस्तुकोवारेमामलाईनआउनेस्थानीयकरणप्रश्नहरुसोध्नमउत्सुक हुन्छु, जस्तै:- गणितकोकुनैखासविषयवस्तुकहाँप्रयोगगरिन्छ।					
97	मसमय- समयमास्थानीयहरुलाईचियापानकार्यक्रममाबोलाएरअप्रत्यक्षरुपलेस्थानीयगणितकोवारेमा जानकारीलिन्छु,जस्तै:- फलनकोबारेमाप्रश्नहरुतयारपारीसोध्छुवायस्तैकेहीकोबारेमा।					
98	गणितमास्थानीयविषयवस्तुकोप्रयोगकोवारेमाप्रकाशितलेखहरुविभिन्नस्रोतहरुबाटजम्मागरी अध्ययनगर्छु।					
99	ICT कोप्रयोगगरीमविभिन्नसंस्कृतिकोवारेमाजानकारीलिन्छु।					
100	मविद्यालयमापढ्नेविद्यार्थीहरुकोसंस्कृतिकोवारेमाजानकारीलिईगणितीयप्रयोगकोवारेमा खोजीगर्छु, जस्तै:- पिङ्गबनाउदात्यहापिरमिडकोधरणाप्रयोगभइरहेकोहुन्छ।					
101	मविद्यार्थीहरुकोस्थानीयपरिवेशलाई (वातावरणलाई) बुझ्नसमुदायकोभ्रमणगर्छु।					

10 2	मविद्यालयगणितकोधारणालाईकुनस्थानीयक्रियाकलापसंगजोड्नसकियोभनेसिकाइप्रभाव कारीहुनसक्छभनेकुरासिक्नउत्सुकहुन्छु ।					
10 3	समूदायसंगछलफलमानबुझेकोसांस्कृतिकविषयवस्तु Information Communication Technology कोप्रयोगगरीअध्ययनगर्छु ।					
10 4	गणितमाआएकानयाँ-नयाँधारणाहरुरयसकोस्थानीयप्रयोगबारेमामनिरन्तरअध्ययनगर्छु ।					
10 5	ICT कोप्रयोगगरीस्थानीयगणितीयधारणाहरुलाईविद्यालयगणितलाईकसरीप्रभावकारीबनाउन सकिन्छभन्नेकुरामाविचारगर्छु ।					
10 6	ICT कोप्रयोगगरीसांस्कृतिकगणितीयरविद्यालयगणितबीचकोसूक्ष्मसम्बन्धकसरीदेखाउनसकि न्छभन्नेकुरामाविचारगर्छु ।					

कृपयायोसर्वेक्षणफारम२४घण्टाभित्र पुरागरीउक्तफारमलाईपुन: खाममाहालेरविद्यालयमा राखीदिनुहुनअनुरोधगर्दछु।

तपाईकोसहभागितारसहीप्रतिक्रियाकोलागीहृदयदेखिनैआभारप्रकटगर्दछु ।

❄❄धन्यवाद❄❄

APPENDIX B: FINAL SURVEY TOOL

"माध्यमिक तहमा स्थानीय गणितको एकीकरणको बारेमा शिक्षकहरुको धारणा" सम्बन्धीप्रश्नावलीहरु

QUESTIONNAIRE OF TEACHERS' PERCEPTION OF INTEGRATION OF ETHNOMATHEMATICS IN SECONDARY LEVEL

आदरणीय गणित शिक्षक,

गणित शिक्षक भएको हुनाले तपाईलाई स्थानीयस्तरमा प्रयोग हुने गणितको बारेमा अवगत होला, जुन तपाई प्रत्यक्ष वा अप्रत्यक्ष रूपमा कक्षाकोठामा प्रयोग गरिरहनु भएको छ। यसको बारेमा अध्ययन गर्न सकियो भने, यसले शिक्षकको पेशागत विकास, विद्यार्थीहरुको बुझाइ सुधार्नुका साथ-साथै उनीहरूको उपलब्धि पनि सुधार गर्न महत्वपूर्ण भूमिका खेल्न सक्छ । त्यसैले, यो सर्वेक्षणमा तपाईको प्रतिक्रिया आवश्यक देखिन्छ ।

म माध्यमिक तहमा शिक्षण गर्ने गणित शिक्षकहरूको "माध्यमिक तहमा स्थानीय गणितको एकीकरणको बारेमा शिक्षकहरूको धारणा" के छ र कुन-कुन तत्वहरूले यसको एकीकरणमा योग्दान पुर्याइरहेको छ। मेरो अध्ययन क्षेत्र ललितपुर जिल्ला भएकोले यो जिल्लामा माध्यमिक तहमा शिक्षण गर्ने गणित शिक्षकहरू मेरो अध्ययन जनसङ्ख्यामा पर्नुहुन्छ।

यो सर्वेक्षणमा तपाईको सहभागिता एक प्रतिक्रियादाताको रुपमा छ। यो अध्ययनमा तपाईको व्यक्तिगत जानकारी र प्रतिकृया गोपनियता (Confidentiality) र अज्ञातता (Anonymity) का साथ निश्चित गरी राख्नुका साथै पहिचान नहुने गरी सान्केतिकरण (कोडिङ) गरी राखिने छ जसले गर्दा भविष्यमा तपाईहरूलाई कुनै प्रकारको वाधा पर्ने छैन। कृपया ध्यानराख्नुहोस्, यो तथ्याङ्क(data) यस अध्ययनको लागि मात्र प्रयोग गरिनेछ।

यो सर्वेक्षणमा सहभागी भई आफ्नो अमूल्य प्रतिकृया दिनुभएकोले म तपाईलाई हृदयदेखि आभार प्रकट गर्छु। यो सर्वेक्षणको प्रश्नावली पुरा गर्न ३० देखि ४० मिनेट लग्नेछ। कृपया यो सर्वेक्षण फारम २४ घण्टा भित्र पुरा गरी उक्त फारमलाई पुन: खाममा हालेर विद्यालयमा राखी दिनुहुन अनुरोध गर्दछु। यसमा समावेश भएका प्रश्नहरु विद्यालय प्रक्रियाको चार ओटा क्षेत्र समेटिने गरि तयार गरिएको छ, जुन निम्नानुसार रहेका छन्।

(1) पाठ्यक्रम (2) पाठ्यपुस्तक (3) कक्षाकोठा प्रक्रिया (4) शिक्षक सिकाई

निवेदक

नाम:- सुरेन्द्र कुमार ठाकुर
तह:-स्नाकोत्तर (Master),
विश्वविद्यालय:- काठमान्डौ विश्वविद्यालय,
स्कूल अफ इजुकेशन हात्तिवन, ललितपुर

❄❄ कृपया अर्को पृष्ठ (पना) पल्टानुहोस् ❄❄

कृपया तल दिइएका खाली ठाउँमा सही जानकारी भर्नुहोस् र कोठाहरुमा सही जानकारी भएको कोठामा (✓) लगाउनुहोस् ।

3. लिङ्ग:- पुरुष ☐ महिला ☐ **2. उमेर:**--------- वर्ष **3. जात:-** ---------- **4. धर्म:-** ----------

5. पारिवारीक पेशा:- ---------- **6. अध्ययन गरेको विद्यालयको प्रकार:-** सरकारी ☐ निजी ☐

7. शिक्षण गरिरहेको विद्यालयको प्रकार: सरकारी ☐ निजी ☐ **8. शैक्षिक योग्यता:-** ----------

9. म स्थायी ☐ अस्थायी ☐ **शिक्षक छु ।** **10.** Part-TimeF ☐ ime **प ☐ ने शिक्षक छु ।**

11. संकाय: शिक्षा ☐ विज्ञान ☐ व्यवस्थापन ☐ अन्यभए (नाम लेख्नुहोस्):----------

12. तपाईले शिक्षण पेशा शुरु गरेको कति बर्ष भयो ? 0 देखि 1 ☐ 1 देखि 5 ☐ 5 देखि 10 ☐

10 भन्दा माथि ☐

13. के तपाईले कुनै शिक्षक पेशागत विकास कार्यक्रममा (TPD) सहभागी हुनुभएको छ? हो ☐ होइन ☐

यदि हो भने कति पटक सहभागी हुनुभएको छ? 1 पटक ☐ 2 पटक ☐ 3 पटक ☐

3 पटक भन्दा बढी ☐

यस प्रश्नावलीमा आवश्यक शब्दहरुको परिभाषा सुची पनि समावेश गरिएको छ, जुन निम्नानुसार रहेका छन् ।

संस्कृति:- कुनै राष्ट्रको वा जातिको सामाजिक जीवन अर्थव्यवस्था आदिमा प्रतिबिम्बित हुने र तिनका कलाकौशल बौद्धिक विकास आदिमा प्रकट हुने र तिनका क्रियाकलापको परिस्कृत रुप

सांस्कृतिकअनुभवहरु:- व्यक्तिले आफ्ना संस्कृतिमा बिताएका पलहरु, क्षणहरुको समष्टिगत रुप

सांस्कृतिक गणित:- संस्कृतिमा पाइने गणित

सांस्कृतिक प्रतिभा:- सांस्कृतिक ज्ञानले कुनै काम गर्न योग्य भएका

सांस्कृतिक क्रियाकलाप:- साझा उद्देश्यहरु लिई एक ठाउँमा भेला भएका व्यक्तिहरुले गर्ने क्रियाकलाप

विद्यार्थीहरुको संस्कृति:- बिद्यालयमा भएका विद्यार्थीहरुको संस्कृति

संस्कृतिसापेक्ष:- संस्कृतिको मर्मलाई बुझ्नेगरी गरिने कार्य

❄❄ कृपया अर्को पृष्ठ (पना) पल्टानुहोस् ❄❄

माध्यमिक तहमा शिक्षण गर्ने शिक्षकहरुको "स्थानीय गणितको एकीकरणको (INTEGRATION OF ETHNOMATHEMATICS) बारेमा शिक्षकको धारणा" सम्बन्धी प्रश्नावलीहरु

कृपया प्रत्येक कथनलाई ध्यानपूर्वक पढी त्यसको बारेमा तपाई आफनो प्रतिक्रियालाई पाँचओटा कोठा मध्ये तपाई पूर्णरुपले सहमत भएको कोठामा (✓) लगाउनुहोस् ।

पू. स. – पूर्ण सहमत, स. – सहमत, त. – तटस्थ, अ. - असहमत, पू. अ. - पूर्ण असहमत

सि.न.	प्रश्नहरु	पू.स.	स.	त.	अ.	पू.अ.
1	गणित पाठ्यक्रमले प्रत्येक व्यक्तिको सांस्कृतिकअनुभवहरु समेटिने गरी उद्देश्य निर्धारण गरेको छ ।					
2	गणित पाठ्यक्रमका विषयवस्तु वास्तविक सांस्कृतिक अनुभवहरुका आधारमा तयार पारिएका छन् ।					
3	पाठ्यक्रमको स्रोतसामग्रीमा सांस्कृतिक गणितको जानकारीबाट विषयवस्तुको उठान गरेको पाइन्छ ।					
4	पाठ्यक्रममा उल्लेखित शिक्षण विधिहरुको प्रयोग गरी व्यक्तिको सांस्कृतिक प्रतिभा उजागर गर्न सकिन्छ ।					
5	स्थानीय चाडपर्वमा प्रयोग हुने गणितीय क्रियाकलापलाई मुल्यांकनको रुपमा स्वीकार्ने वातावरण यो पाठ्यक्रमले दिएको छ ।					
6	गणित पाठ्यक्रमले विद्यार्थीहरुको संस्कृतिलाई सिकाइ स्रोतको रुपमा स्वीकारेको पाइन्छ ।					
7	पाठ्यक्रममा शिक्षण रणनीतिहरु स्थानीय सांस्कृतिसापेक्ष समावेश गरेको पाइन्छ ।					
8	गणित पाठ्यक्रमले सांस्कृतिक उदाहरणहरुको प्रयोग नै गणित शिक्षणको उपयुक्त तरिका छन् ।					
9	गणित पाठ्यपुस्तकमा उल्लेखित परिभाषाहरुमा दैनिक जीवनमा पाइने शब्द र शब्दावलीको प्रयोग गरेको पाइन्छ ।					
10	गणित पाठ्यपुस्तकमा प्रयोग हुने शब्दावली सांस्कृतिक अर्थ झल्किने गरी अर्थ उल्लेख गरिएको छ ।					
11	गणित पाठ्यपुस्तकमा भएका दृष्टान्तहरु (Illustrations) सांस्कृतिक छन्, जस्तै:- पिरामिडमा पिङ्गको तस्वीर ।					
12	गणितको कक्षाकोठा प्रक्रियामा छलफललाई आधार बनाउँछु किनभने यसले एकअर्काको सांस्कृतिक क्रियाकलाप आदानप्रदान गर्न मदत गर्छ ।					
13	म गृहकार्यमा समाजमा पाइने उदाहरणहरु खोजेर ल्याउने कार्य दिन्छु ।					
14	म विद्यार्थीहरुको सांस्कृतिमा पाइने गणितलाई गीतको रुप दिने कार्य गृहकार्यको रुपमा दिन्छु. जस्तै:- छठपर्वको गीतमा गणितमा परिणत गरि सुनाउन लगाउने आदि ।					
15	म विद्यार्थीहरुलाई समाजमा भएका गणितीय धारणालाई रमाइलो हुने स्थानीय क्रियाकलापमा ढालेर ल्याउने कार्य गृहकार्यमा दिन्छु ।					
16	म विद्यार्थीहरुलाई उनीहरुको सांस्कृतिमा विभिन्न परिकार निर्माणमा प्रयोग हुने धारणाको वारेमा खोज गर्ने कार्य गृहकार्यको रुपमा दिन्छु ।					
17	म विद्यार्थीहरुको सांस्कृतिमा प्रयोग भइरहेको गणितीय धारणाको बारेमा खोज गर्ने कार्य गृहकार्यको रुपमा दिन्छु ।					
18	म शिक्षक निर्मित परीक्षामा विद्यार्थीहरुको सांस्कृतिकगणितीय उदाहरण आउने प्रश्नहरु निर्माण गर्छु ।					

19	स्तरीयकृत परीक्षाको लागि प्रश्नहरु निर्माण गर्नुपर्दा विद्यार्थीहरुको सांस्कृतिक गणितीय अवधारणाको उपयोग आउने गरी निर्माण गर्छु।					
20	म समय-समयमा स्थानीयहरुलाई चियापान कार्यक्रममा बोलाएर अप्रत्यक्ष रुपले स्थानीय गणितको वारेमा जानकारी लिन्छु, जस्तै:- फलनको (function) बारेमा प्रश्नहरु तयार पारी सोध्छु वा यस्तै केहीको बारेमा।					
21	सुचना संचार तथा प्रविधि (ICT) को प्रयोग गरी म विभिन्न संस्कृतिको वारेमा जानकारी लिन्छु।					
22	म विद्यालयमा पढ्ने विद्यार्थीहरुको संस्कृतिको वारेमा जानकारी लिई गणितीय प्रयोगको वारेमा खोजी गर्छु, जस्तै:- पिङ्ग बनाउदा त्यहा पिरमिडको धरणा प्रयोग भइरहेको हुन्छ।					

कृपया यो सर्वेक्षण फारम २४ घण्टा भित्र पुरा गरी उक्त फारमलाई पुन: खाममा हालेर विद्यालयमा राखी दिनुहुन अनुरोध गर्दछु।

तपाईको सहभागिता र सही प्रतिक्रियाको लागी हृदय देखि नै आभार प्रकट गर्दछु।

❄❄ धन्यवाद ❄❄