PEDAGOGICAL PRACTICES OF MATHEMATICS TEACHERS AT LOWER SECONDARY LEVEL

A

THESIS

BY

RAJENDRA MAHAT

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SUKUNA MULTIPLE CAMPUS
कोसीहरैंचा नगरपालिका, मोरङ
KOSHI HARAINCHA MUNICIPALITY, MORANG
स्था : २०४८

मिति : .....

विषय

RECOMMENDATION LETTER

This is to certify that Mr. Rajendra Mahat, a student of academic year 2066/2067 with campus roll number 87, thesis number 26, exam roll number 2140214 and T.U. registration number 9-1-9-418-2004, has completed his thesis under the rules and regulations of Tribhuvan University, Nepal. The thesis entitled **'Pedagogical Practices of Mathematics Teachers at Lower Secondary Level'** embodies results of his investigation conducted during the period 2014 to 2015 in the Department of Mathematics Education, Sukuna Multiple Campus, Tribhuvan University, Koshi Haraicha Municipality, Morang, Nepal. I hereby, recommend and forward that this thesis be submitted for the evaluation as the partial requirements to award the Degree of Master of Education.

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(Mr. Rajkumar Niroula)
Supervisor
Department of Mathematics Education
Sukuna Multiple Campus
Koshi Haraicha, Morang

Date 2071-10-18.....

त्रिभुवन विश्वविद्यालयद्वारा सम्बन्धनप्राप्त

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मिति : ....

विषय : **Approval Letter**

This thesis by Rajendra Mahat, entitled, **"Pedagogical Practices of Mathematics Teachers at Lower Secondary Level"** has been approved in partial fulfillment of the requirements of the Degree of Master of Education in Mathematics.

Committee for the Viva-voce	**Signature**
Mr. Prem Tamang (Chairman)	....
Prof. Dr. Abdul Quaiyum (External)	....
Mr. Rajkumar Niroula (Supervisor)	....

Date : 2072-01-10
2015-04-23

E-Mail: sukunac@yahoo.com Website: www.sukuna.edu.np Noticeboard: 1618021545715

DECLERATION

I hereby declare to the best of my knowledge that this thesis is original. No part of it was earlier submitted for the candidature of research degree to any university.

……

RajendraMahat

Date:……

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Rajendra Mahat

Date: ……

ABSTRACT

There are some studies done regarding the teaching learning behavior of mathematics teachers in diverse students' group. So, this study was conducted to find out the real situation of mathematics classroom, explore mathematics teachers' management skill of diverse student's class and recognize the learning needs and real status of diverse students in Lower Secondary Level. Its topic was 'Pedagogical Practices of Mathematics Teachers at Lower Secondary Level'.

This study had 3 objectives and these objectives were broken down into 5 parts as research question. To achieve the desired objectives, this study was delimited into Sankhuwashava district from which five schools were selected as sample by using purposive sampling. The contents; genders, mental and ethnic diversity of students were delimited for this study. The sampled schools were Shree Rameshowr HSS., Mamling-6, Shree Saraswati HSS., Chainpur-10, Shree Sharada HSS., Chainpur-16, Shree Sharada LSS., Mamling-2 and Shree Lower Secondary School (Rukminibhawan), Aankhibhuin-2. by using purposive sampling. 5/5 students per each school or in total 25 students, were also selected among 642 students by using purposive sampling and 6 lower secondary level math teachers were selected among 27 mathematics teachers from respective sampled schools. Interview, questionnaire and class observation were conducted to collect essential data. These were obtained from primary and secondary sources.

The obtained data were analyzed mostly with qualitative method and lesley quantitative method. After analyzing the obtained data; major findings are put in three groups in accordance to the objectives. So the pedagogical practices of math teacher were not fruitful. Hence, major recommendations are given to all level.

TABLE OF CONTENTS

ABBREVATIONS

BEC	:	Basic Education Curriculum
B. S.	:	Bikram Sambat
CBS	:	Central Bureau of Statistics
CDC	;	Curriculum Development Center
CERID	:	Research Center for Educational Innovation and Development
DEO	:	District Education Office
HSS	:	Higher Secondary School
IAE	:	International Academy of Education
IBE	:	International Bureau of Education
LSS	:	Lower Secondary School
MOE	:	Ministry of Education
NESP	:	National Education System Plan
NNEPC	:	Nepal National Education Planning Commission
PCL	:	Proficiency Certificate Level
UNESCO	:	United Nations Educational, Scientific and Cultural Organization
VDC	:	Village Development Committee

List of Tables

List of Figures

Chapter: I

INTRODUCTION

1.1 Background of Study

Education is early foundation of human beings. Education guided men form stone age to this modern age in all aspects i.e. physical, mental, social, economical, spiritual, moral aspects of humans are developed by education. Education process was started form indigenous period but the view and meaning of education is changing day by day which also happened in the past. Therefore the prime minister of Nepal Janga Bahadur Rana started English education in 1910 Ashwin 27 in Nepal. (Sharma, 2068).

Because of the development of social consciousness and global necessity, the structure of education should be changed. Hence to improve the structure of education, different kinds of reports have been given which were given by different studies. They are as follows. In 2011 bikramsambat NNEPC-2011 had reported on 'education in Nepal'. This commission had given some recommendations on national educational objectives, level wise educational objectives, curriculum, instructional methods, examination system, school management system and teacher training. But the recommendations of this commission were not applied effectively. In 2017 B.S. political structure of Nepal was changed. A new committee of education was made in 2018 B.S. whose main objective was to apply new education system in Nepal. This committee had also recommended for the improvement in education system, media of teaching and teacher training. After analyzing the implication aspects of this committee's actions; NESP-2028 was made to fulfill the remaining works in education system. This plan is called as a new plan of education in Nepal because it reformed in education system. It reconstructed in national objectives of education, level wise objectives of education,

subject wise objectives of education, organization of education, curriculum, textbook, teacher training, facilities of teachers, education administration, evaluation system, supervision system. NESP had concluded that teacher training affected teaching learning activities of teachers. So it stressed on teacher training. It had given two problems in teacher training. They were increase the number of trained teachers and increase the quality of training. It had purposed to make a committee to organize the systems, supervision systems of teacher training. It had also purposed the in-service teacher training and pre-service teacher training. These all types of training may be helpful to improve in teaching. Other commissions on education system were also helpful for teachers' profession (Sharma, 2066).

Mathematics was used in previous period. Now aday mathematics' application has been developing.So that necessity of mathematics is developing day by day. Hence a compulsory and important place has been given to mathematics because it has many behavioral aspects.

In fact mathematics is as like as language because it is a basic tool of communication. Mathematical concepts are frequently used in daily communication. Thus it is quite essential that this subject should be given an important place, second to language in school education. Most of students feel mathematics is a subject of fear. The curriculum of mathematics is very much ambitious and much vast course for all students in Nepalese context. In a class of mixed ability children, mathematics teaching is very challenging. Some schools are poor or physically poor. So, such type of schools does not have good class rooms. Hence, school does not have good classroom for each and every students' place. Also such types of school haven't enough facility of light, air, shining blackboard or whiteboard good conditioned roof and bars. One can imagine how effective teaching can be accepted in such school

classroom. If a teacher does not know the particular students' situation; how could be teach effectively? Most of our schools' mathematics teachers are frequently changing because of their opportunities, which is also a major cause of poor result of mathematics teaching.

For the development at several new branches of mathematics as well as new application of mathematics, the functions of a mathematics curriculum seems to be depend more than ever before on how we organize body of knowledge. We organize mathematical learning experiences and how we perceive the nature of mathematics effectively and meaningfully. But to achieve this objective is not easy as one thinks because as there is no single best teaching approach to be prescribed. The best method is that which generates teaching for understanding and meaningful learning.

Mathematics has its own terminology, vocabulary and technical terms. All of them are difficult for lower secondary level and other school level students. So, it is a most main challenging point for mathematics teacher. In a good mathematical classroom activity of the teacher; they should address the problems of each and every students .i.e. they should fulfill the desires of different kinds of students.

The teaching learning process in lower secondary level is affected by learners' mother tongue. It is already said that mathematics is also a kind of communication language because each ethnical group has their own mathematical vocabulary and terminology. Hence a good teacher should match the ethnical vocabulary of mathematics and the vocabulary and terminology which are used in mathematics text book or in common sense.

Previously, mathematics and mathematics education were thought same. Now a day's mathematics and mathematics education are separate because of their objectives and process in academic. These are two

distinct disciplines. Mathematics is theoretical aspect which develops theories and develops the field of mathematics. Mathematics helps to find out new theories, axioms, and principles. On the other hand mathematics education is a mixture of science and art because it deals social aspect or behavioral aspect. In this discipline mathematics teaching learning methods, materials and presentations in every field living beings are involved.

We can get variability in mathematics classroom because there are ethnically, economically; geographically different children but most teachers perform their teaching activity equally. Such teaching learning activities or pedagogical practices of mathematics teacher may result in inequality and discrimination for those children in order to gain equal learning experiences in mathematics. Hence this study would be an attempt to bring out the classroom activities or pedagogical practices of mathematics teachers in terms of mixed ability group of students.

1.1.1 Introduction of Pedagogy

The term pedagogy is related to effective teaching so for effective teaching method should be suited. The effective teaching can be developed by giving appropriate teacher training. Hence in Nepal teacher training was started in 2004 B.S. by 'Basic Teacher Training Center' (Thakur, 2071).

There are different meanings of pedagogy. Most of them; some are defined as follow. The word pedagogy is made by peda+gogy, in which peda mean children and gogy means teaching ' (Pal, Shah, Bhattrai and Bhusal, 2065). Also the study of teaching method is called pedagogy.

From the above definition, we can say that implication of teaching materials, teacher's student motivation power, teaching procedure, evaluation procedure etc. are included in pedagogy.

1.2 Statement of the Problems

There are some cases of studies or research about anything which are problem. Researcher has proposed the title "pedagogical practices of mathematics teacher in lower secondary level." For this research which has been taken as this research problem. And this inquiry had tried to explore the real situation of the use of teaching methods, materials and evaluation system of mathematics' teacher.

In Nepal mathematics is taken as compulsory subject in school level. So, it helps people to solve domestic and academic mathematical problems. But most of people think that mathematics is difficult subject to study and learn. Pedagogical practices of mathematics teachers may be main causes of such type of result. This country is also a multicultural and multilingual. Hence most of mathematics classroom of this country are ethnically plural. Hence there are multi-able students to which teacher should teach appropriately by using suitable method and materials. It is evident that those students who have mother tongue other than Nepali language are less likely to survive in the classroom where teachers use Nepali as only medium of instruction.

The teaching materials, contents, methods and evaluation system are sometimes questionable in term of their stance to address diverse need of the plural classroom. In many causes the materials portrait the mainstream culture overlooking the identity and presence of deserve culture groups. It is fact that mother tongue should be used in lower secondary level. In our country here are 125 casts and 123 mother tongues (CBS, 2069, P. 11).

Therefore, it is fruitful to consider the extent to which teacher learning activities in classroom practice embrace the multicultural pedagogy in order to respond to the learning need of the diverse group of students.

There are some researches done in Nepal in order to inquire the extent to which linguistic diversity is managed through pedagogical practice. Hence, this research, attempts to explore pedagogical practices of mathematics teachers at lower secondary level. Especially, the following questionable problems are mentioned to solve this research problem:

- What type of pedagogical practices do mathematics teachers employ in classroom which helps to address the need of diverse students in lower secondary level?
- How do the mathematics teachers motive students without any discrimination and violence in classroom practices while dealing with those diverse students?
- What kind of classroom practices do mathematics teachers do to which these different students think appropriate to address their needs in terms of mathematics?
- What kind of teaching obstacles do mathematics teacher feel while dealing with unmetered students in classroom?
- How do students accept their learning problems in mathematics class?
- What conclusion can be drawn to improve the pedagogical practices of mathematics teachers in lower secondary level?

1.3 Rational of the Study

There are different and individual significances to research about any subject. If any action was not significant, the research would not be done. Hence first significance of this study is to study and identify the aspects of this research 'pedagogical practices of mathematics teachers at lower secondary level.'

Mathematics is not only connected to the world of numbers, but also the physical world around us and the phenomena that occur within it. Mathematics is compulsory subject for school level. Hence each and every student of school level should study mathematics which helps to get quality life. On the other hand, for the quality life of students; each and every mathematics teacher should provide equal learning experience for all students. Furthermore, the mathematics teacher can bring the change in his teaching learning activities in the classroom in light of providing equal learning experiences for theses diverse students through seeking more favorable learning environment in classroom as well as school.

The significances of this study are as given below:

- This study will be fruitful to improve mathematics teachers' and other teachers' classroom activities.
- It will be helpful to study about society.
- It will be helpful to find out students centered methods.
- It will provide new teaching learning skills.
- It will be guide line for further mathematical researchers.
- It will be benefitted and informative in their respective fields for planners, designers, decision makers etc.

1.4 Objectives of the Study

The overall objective of this study was to find out the pedagogical practices of mathematics teachers at lower secondary level. However, the other objectives of this research were:

- To find out the real situation of mathematics classroom in lower secondary level.
- To explore diverse (gender, mental and ethnical) classroom management skill of teacher through pedagogical practice.

- To recognize the learning needs and real mathematical stage of lower secondary level diverse students'.

1.5 Research Questions

The research questionswere as follow which were made by breaking down the objectives of this study and they helped it as the guidelines.

- Is there suitable classroom environment for students in teaching learning process?
- What is the real mathematical level of lower secondary level students?
- Does math's teacher establish individual interaction to students?
- Is the teacher helpful?
- Does the teacher have psychological knowledge about children's?

1.6 Delimitation of the Study

Because of the less availability of researcher's on time and logistic support, this study had some delimitation. So the researcher had delimited the study:

- In Sankhuwasava district from which three higher secondary schools and two lower secondary schools were taken for knowing lower secondary level mathematics teachers' pedagogical practices.
- Among five schools, one school for class observation and all schools for teachers' and students' responses.
- Took two months for the response of related teacher and students.
- To classroom activities of mathematics teachers.
- To respondents – students and mathematics teachers.
- To primary and secondary data.
- To mixed approach i.e. qualitative and quantitative approach.
- To gender, mental and ethnical group students.

Chapter: II

REVIEW OF THE RELATED LITERATURE AND THEORETICAL FRAMEWORK

2.1 Review of Related Literature

Because of the diverse needs of Nepalese students; few researches have been done. They are:

Niroula (2010) studied "pedagogical practices of mathematics teacher in ethnically plural classroom of secondary level". The objectives of this study were to explore mathematics teacher's ability to manage the students' diversity (culture, ethnic, linguistic) through pedagogical practices in the classroom and to investigate the learning need of diverse students in mathematics teaching learning activities. At the end of his research he found that the mathematics teachers are untrained to teach multi ethnic students. It was also found that co-curricular activities related to tradition of the community were not done in school mostly.

CERID (2002) studied "classroom teaching /learning (Classroom Delivery)". This study was mainly conducted on situational analysis of the curriculum, text book and teachers guide and transfer of training skill for classroom delivery. On this study, it found that more often teachers used textbook only but not used curriculum and teacher guide. After the analysis of the curriculum and teacher's guide related to concern lesson of the classroom delivery indicated that teachers had concluded that curriculum and teacher guide should be followed for the fulfillment of the needs of classroom delivery.

Subedi (2006) studied on the topic "behavior of trained teacher in classroom practice in mathematics". The objectives of this study were to identify the entering behavior of trained mathematics teacher and to indentify the activities and conducted evaluation procedure by trained

teachers in the classroom practices. The study found that the classroom activities or behaviors of trained teachers were effective in the classroom because most of the trained mathematics teachers were skillful to motivate students by creating suitable classroom environment. It was also found that trained teacher evaluated students by using appropriate evaluation tools with the help of feedback and continuous assessment.

Thapa (2005) studied on "problem faced by teachers in teaching mathematics at primary level" with objectives to identify the problem faced by primary level mathematics teachers in teaching mathematics and compare the problems faced by primary level mathematics teachers in teaching at rural schools and urban schools. Then it found out; there was significant difference in the pattern of the problems faced by rural and urban teachers. But the main problems in both urban and rural schools primary level mathematics teachers were large class size, irrelevancy of teacher guide book in the sense of teachers' needs, lack of instructional materials, inadequacy of teacher training, lack of supervisory help, lack of physical facilities etc. on the other hand, the students claim was that they had low level motivation to learn mathematics.

Poudel (2069) studied about "implementation aspect of practice teaching in higher secondary level". The researcher studied on the basis of three objectives. One of them was to indentify the effectiveness of practice teaching program and found that student teachers would be able to develop the skill to manage classroom. They could also develop the skill to make instructional plans and teaching learning activities which effect mathematics teaching learning in primary and lower secondary level because practice teaching is pre service training.

Tripathi (2005) studied "Relation of classroom practices with mathematics curriculum". The objectives of this study were to find out the relationship between intended mathematics curriculum and classroom

practices and to indentify the factors that influence for curriculum implementation in classroom practices. The researcher tired to explore relationship between intended mathematics curriculum and classroom practices and indentify the factors that influence for curriculum implementation. It was found that the intended mathematics curriculum and classroom practices were lesley related because of the lackness of physical facilities, qualified and trained teachers, instructional materials, continuous assessment system, standardized test. On the other hand, the above factors were helpful to influence curriculum implementation.

Another study done by (Subedi, 2005) entitled "mathematics learning management in an effective school: A case practice in Nepalese school." The objectives of this study were to describe the learning environment for mathematics learning, analyze the teacher and student work in the classroom, indentify the instructional strategies promoted for mathematics learning, and investigate the type of additional support of low performers on mathematics learning in effective school. In this research researcher found that near about one fourth of trained teachers were found preparing annual plan for their instruction through most of them used annual plan of teachers guide as their own plan. Very few number of trained teachers were found having lesson plans. He also found that most of trained secondary mathematics teachers were found using classroom management skill basically in searing arrangements of the class. He noticed only one positive effect of training that most of the trained mathematics teachers revised the previous lesson in the class while teaching.

Anthony and Walshaw (2009) studied about effective pedagogy in mathematics on educational practices series-19 and concluded that the nature of mathematics teaching significantly affects that nature and outcomes of student learning. This highlighted the huge responsibility

teachers have for their student's mathematical well-being. In this booklet, there offer be ten principles as a starting point for discussing change, innovation, and reform. These principals should be viewed as a whole, not in isolation: teaching is complex, and many interrelated factors have an impact on student learning. The booklet offered the ways to address that complexity, and to make mathematics teaching more effective.

Major innovation and genuine reform required aligning the efforts of all those involved in student mathematical development; teachers, principals, teacher educators, researchers, parents, specialist support services, school boards, policy maker, and the students themselves. Changes needed to be negotiated and carried through in classroom teams, departments, and faculties, and in teacher education programmers. Innovation and reform must be provided with adequate resources. Schools, communities and nations needed to ensure that their teacher have the knowledge, skills, resources and incentives to provide students with the very best of learning opportunities. In this way, too all students would have the opportunity to view themselves as powerful learner's of mathematics.

In the above researches, most of researchers have studied classroom behavior of mathematics teachers by evaluating the appropriate use of instructional materials, measurement skills of students' previous knowledge, teachers' ways of providing equal learning experiences, classroom management skills of teachers. They also studied about the effects of appropriate teacher training which would be helpful to fulfill the teaching problems in mathematics class. But the above researchers have given less importance in psychological knowledge of mathematics teachers which may be used in pedagogical practices. So the researcher has done this research by including the psychological knowledge of mathematics teachers with the help of other aspects of pedagogical

practices which may be helpful for the improvement of real education system of Nepal.

2.2 Theoretical Framework

For theoretical framework; the following cognitive and constructive theories have been taken:

Vygotsky carried constructivism theory which is related to the creativities and experiences of children. It neglects the experiences and fact of others. This theory is called constructivism because it gives new thoughts and construction. According to Vygotsky social establishment is main foundation of learning. Social establishment is mixing condition of environment situation and interaction. In his learning theory; private speech, scaffolding and zone of proximal development are included. Main priority is given to private speech, scaffolding and zone of proximal development in which free chance for talking and understanding about subject matter is given to students. The teachers or subject specialists should help students to correct wrong concept which is called scaffolding. The probable learning domain obtained from scaffolding is called zone of proximal development. In this way the learners solve problems according to their abilities.

Application in Pedagogical Practices:

To indentify individual differences, to encourage students in discovery method, to solve teaching problems, to encourage students to take part in teacher and students' interaction, to select and apply instructional materials and methods; Vygotsky's theory is very applicable for pedagogical practices in lower secondary level.

Piaget developed cognitive learning theory which is highest level theory in cognitive psychology. In this theory; he studied childhood development process on the basis of children's behaviors which occurs in different ages. According to him children can learn new things according

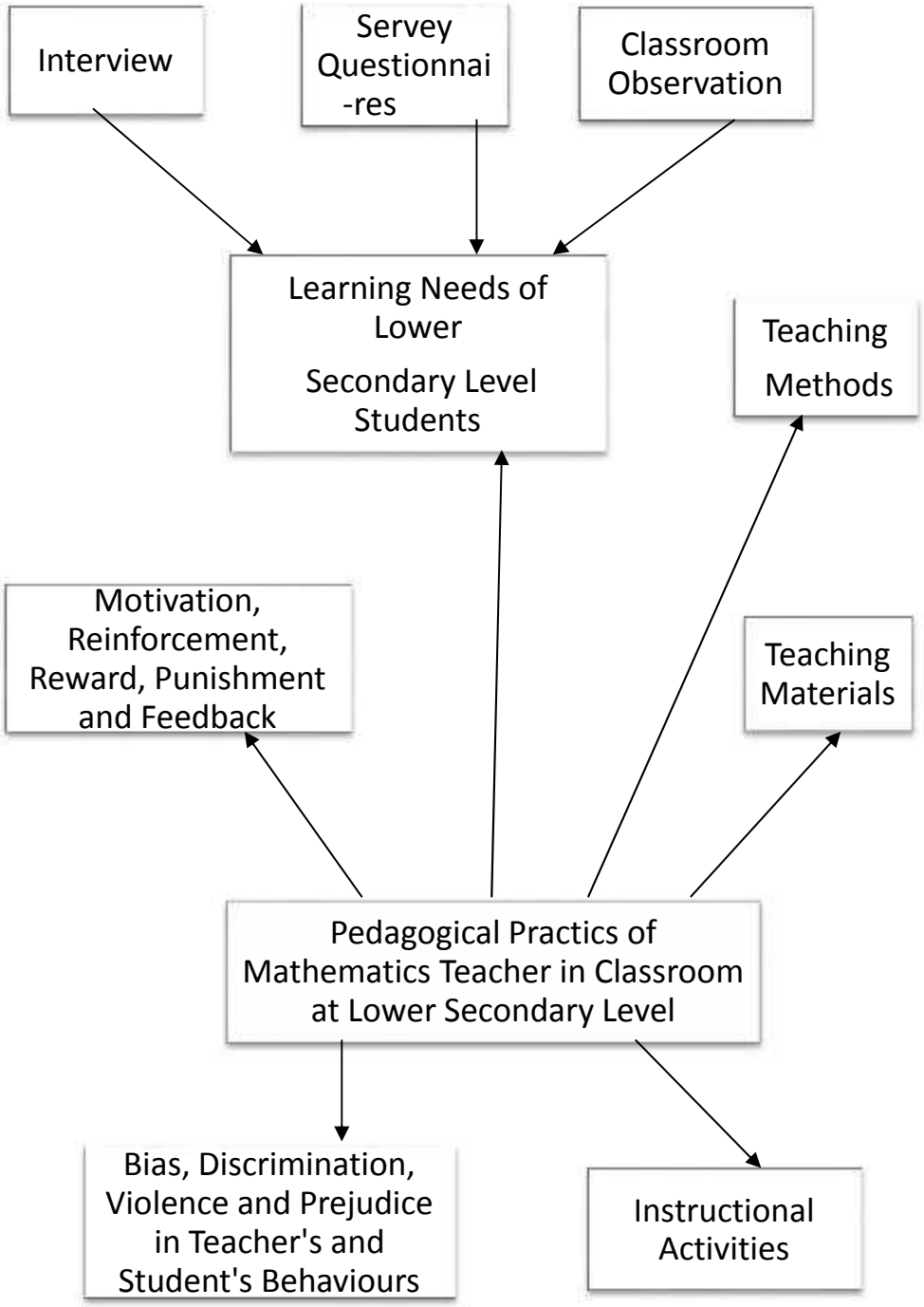
to basic knowledge and maturity. Hence the behaviors of children's are seemed differently in different age groups. He divided the development of children in four groups. They are sensory-motor period, pre-operational period, concrete operational period, and formal operational period. The first step of cognitive development is sensory-motor period which appears form zero years to 18 months in children's. In this period children express his/her response by the movement of body. The second step is pre-operational period which appears from 18 month to 6/7 years in children's. The main characteristics of this period are symbolic representation. In this period the concept of mass conservation is not developed. The third period of cognitive development is concert operational period which appears from 6/7 years to 11/12 years in students. The meaning of concert is starting point for operation is a real system of objects and relations. In this period children identify concert thing, generalize and classify concert objects. The main characteristic of this period is conservation concept. The last period of his theory is formal operational period which appears in children from the age 11/12 years to above. In this period children can do activities formally. Children can solve problem, select alternatives, write stories, can do concert works, and imagine different works. Hence the main characteristic of this period is imaginative thinking.

Application of Piaget's Theory in Pedagogical Practices:

Piaget's cognitive theory is related to child development hence it is applicable to understand children's concept, to make instructional plans, to manage teaching learning process according to child psychology. These all things belong to pedagogical practices. Hence it is applicable for pedagogical practices.

2.3 Conceptual Framework

For the study of pedagogical practices of mathematics teachers at lower secondary level, researcher has preceded ideas as the following:



The given chart shows that pedagogical practices should be so conducted in mathematics classroom in lower secondary level. For effective mathematics teaching learning, a mathematics teacher should be considering in about teaching method and materials. He/she should also perform instructional activities effectively and should know the learning needs of that level student, which are known by classroom observation, survey questionnaire and interview without any bias, discrimination, violence and prejudice.

A teacher should be helpful and co-operative to every student and motivation, reinforcement, reward and punishment and feedback shouldbe given to students for effective learning. If a teacher followed above framework; he/she will be good in pedagogical practices in mathematics classroom in all levels. Hence, the pedagogical practices of mathematics teachers at lower secondary level had examined on the basis of above conceptual framework.

Chapter: III

METHODS AND PROCEDURES

3.1 Research Design

The study had applied descriptive research design mostly because this type of research is used to describe the data and characteristics about what is being studied. For any research, there should be appropriate investigation methods. Investigation methods are that which are used simply and sequent to fulfill desired work. There are different types of research methods according to the nature of study. Mainly there are two kinds of research, likes as quantitative and qualitative method.

The study, 'pedagogical practices of mathematics teachers at lower secondary level' had delimited in Sankhuwasava district's only five schools. They were Shree Rameshwor HSS., Mamling-6, Sankhuwasava, Shree Saraswati HSS., Chainpur-10, Sankhuwasava,Shree Sharada HSS., Chainpur-16, Sankhuwasava, Shree Sharada LSS., Mamling-2, Sankhuwasava and Shree Lower Secondary School (RukminiBhawan) Phaksi, Aankhibhuin- 2, Sankhuwasava.

In this study qualitative method had been used mostly and quantitative method used partially because the information obtained from the direct classroom observation would be qualitative mostly and only a few numbers of data would be quantitative. In this research, direct class observation, interview, questionnaire were used to collect data. On the other hand, quantitative data were analyzed by using different methods and qualitative data were analyzed and interpreted on the basis of main theme of the study. For the analysis of quantitative data's; percentages, figures and tables were used.

3.2 Population

In this research, the population was taken as a group of 27 mathematics teachers and 642 students of lower secondary level who were teaching and learning in the limited research area.

3.3 Sampling

The necessity aspects; districts, VDC, municipalities, schools, mathematics teachers of lower secondary level and students of lower secondary level were sampled as follows:

3.3.1 Sampling of District, VDC and Municipality

In this study Sankhuwasava district was sampled as a sample district by using purposive sampling, Mamling and Aankhibhuin VDC, Chainpur Municipality were sampled as sample VDC and Municipality by using purposive sampling.

3.3.2 Sampling of School and Mathematics Teacher

Five schools were selected as sample by using purposive sampling on which two lower secondary schools and three higher secondary schools. Among these five schools one school Shree Sharada Higher Secondary School, Chainpur-16, Sankhuwasava was selected on the basis of purposive sampling in order to conduct the classroom observation of the teachers.

Survey questionnaires and interview were conducted for mathematics teachers of all sampled schools. 6 lower secondary level's mathematics teachers were selected from above sampled schools.

3.3.3 Sampling of Student

In this study, 5/5 students were selected from each school by conducting purposive and quota sampling who were selected from most casts and multi-able group. So, the total number of sampled students was 25. Interview was conducted for data collection to students who were taken in sample group.

3.4 Sources of Data

Data are the main aspect of any study because they give true situation of studied subject matter. Data make any study reliable, effective and objective. So both primary source and secondary source were used to collected data in this study.

3.4.1 Primary Sources

The data obtained from sampled math teachers and students by conducting classroom observation, interview and questionnaire were taken as primary sources of data's.

3.4.2 Secondary Sources

These data obtained from schools' registers were taken as this source.

3.5 Tools and Instruments of Data Collection

In the basis of research objectives, scope, limitation and the budgetary framework the tools and instruments of data collection were as followers.

3.5.1 Classroom Observation

For classroom observation researcher observed mathematics classes 5 times of a school from 6 to 8 grades (3 classes). Hence there were altogether 15 class observations conducted with participatory observation. Researcher observed 3 classes per a day. Hence it took at least 5 days for observation. The researcher had divided classroom activities in 3 phases; they were (i) 0-10 min. introductory phase, (ii) 10-30 min. main teaching phase and (iii) 30-45 min. evaluation phase. Within all phases the researchers had observed the teacher's main activities and behavior by using check list. The results obtained from questionnaire and interview may lead wrong result of study. So for true result of any study, the dada obtained from classroom observation are more essential.

3.5.2 Questionnaire

To know the pedagogical practices of math teachers at lower secondary level, questionnaire was used for mathematics teacher in which issues of pedagogical practices of math teachers were included.

3.5.3 Interview

The researcher conducted interview for the student who were studying lower secondary level, to know about their mathematics teacher behavior in classroom teaching. Researcher also took interview with students one by one on which the interview questionnaires were prepared and they were related to the issues concern to teaching method, materials, medium etc.

3.6 Validity of Tools

For the validation of tools i.e. classroom observation, interview and questionnaire, researcher had developed interview guideline and open questionnaires. And then those were discussed in peer group and this studies' supervisor for the establishment of the validity of tools. In this process the weakness of those tools were improved and given final design.

3.7 Data Collection Procedures

Researcher had collected real data by using the prepared data collection tools from sampled 5 schools of Sankhuwasava district. To fulfill the objectives of the study 'Pedagogical practices of mathematics teachers at lower secondary level' data were collected from students, mathematics teachers of lower secondary level of sampled schools by using classroom observation, questionnaire and interview. For the classroom observation, Shree Sharada HSS.was selected because it was familiar to researcher for classroom observation. This school is situated in Chainpur-16, Sankhuwashava. Other required data were collected by using questionnaire for mathematics teacher; interview would be conducted for

all sampled mathematics teacher, and students. For data collection other sampled schools were Shree Saraswati HSS.,Chainpur Municipality-10, Sankhuwashava , Shree Rameshwor HSS., Mamling-6, Sankhuwashava, Shree Lower Secondary School (RukminiBhawan) Phaksi, aankhibhuin-2, Sankhuwashava and Shree Sarada LSS.Mamling-2, Snakhuwashava. These schools were selected as sample by using purposive sampling. In this process he observed classrooms in a school which was taken for classroom observation. Researcher took opinions of sampled mathematics teachers in about pedagogical practices of mathematics teachers at lower secondary level by using questionnaires. Researcher collected information about mathematics teacher's behaviors in classroom by taking interview to lower secondary level students and class observation. Also the qualitative data were found from secondary sources .i.e. journals, different plans, researches etc. Hence both quantitative and qualitative data were collected by using different kinds of data collection tools.

3.8 Data Analysis Procedure

The effectiveness of any study is related to analysis of collected data. So the data analysis procedure should be appropriate. For this study, the data were collected by using different tools in sampled area and it was expected that most of the data would be qualitative which would be analyzed by using descriptive method and some quantitative data would be analyzed by drawing graphs and tables.

Chapter: IV

DATA ANALYSIS AND INTERPRETATION

The data were collected from sampled schools and these data were grouped and then they were analyzed and interpreted systematically. In this chapter the data obtained from classroom observation, from teacher and from students have been analyzed comparatively. The data obtained from students and math teachers have been judged from the data which were obtained from classroom observation.

Data achieved from different sources have their own nature. Hence, the data have been analyzed according to their nature. Some data have been described and some data have been analyzed quantitatively .i.e. by using tables, charts, percentage to give neat figure of this study.

Any work or research is not benefit able while we can't get merits or goals and objectives of that work. So the data have been grouped, analyzed and described in the following heading:

1) Math teacher's ways of finding previous knowledge of students'
2) Mathematics teacher's ways of addressing the need of classroom diversity (gender, mental, ethnical)
3) Procedures for addressing the needs of students' identities
4) Practice and effort of mathematics teacher for equal participation of diverse students (gender, ethnical, mental)
5) Teacher's awareness and conscious about bias, discrimination and violence
6) Teacher's perception on hindrances to teaching different students
7) Mathematics teaching behavior as per the need of diverse students
8) Teacher's and students' perception on the problem of mathematics teaching
9) Psychological knowledge of mathematics teacher

10) Ways of providing equal learning experiences for diverse (gender, mental, ethnic) students in mathematics learning

4.1 Mathematics Teacher's Ways of Finding Previous Knowledge of Students'

Here are some views of teachers related to this topic:

"*To know the previous knowledge of students', we ask students individually in isolation from previous lesson and class." (Teacher's view)*

"I conduct discussion among students about previous lesson to know previous knowledge of students."(Teacher's view)

"Students are divided in different groups according to their capacity and they are asked to do different group activities."(Teacher's view)

"Students are asked some questions from previous lesson."(Teacher's view)

The statements given by teachers show that they find out previous knowledge of students at the first time of mathematics class. Most teachers claimed that they find out previous knowledge by conducting question for students in groups or individually.

In this perspective (BEC, 2069, pg.56) has argued that mathematics teacher should know the previous knowledge of students to learn new things. If they have lack knowledge to learn new thing; teacher should give basic knowledge by motivating and giving feedback for students.

In a classroom there are diverse students. The diversity may be gender, mental, ethnical geographical, economical etc. But in this study only gender, ethnical and mental diversity are included. In this case mathematics teaching learning activities are most challenging because the instructor or teacher should be very serious and conscious to manage classroom environment. There are different kinds of capable students in a

class. Hence, a teacher should know the previous knowledge of students to teach new things. There are also gender differences in a classroom. Many researchers have found that female students are less interested to learn mathematics than male students. So a teacher should be conscious to learn the previous stage of girls and boys without any discrimination and bias.

In this perspective (Shingh, 2066, pg.345) says that a teacher teaches in a class by preparing instructional materials to obtain the goals and objectives of a general curriculum and for quality education. But a poor student does not learn this because of his/her capacity. So the presentation of that class becomes as "Maruni Nach". Hence for the fulfillment of the goals and objectives of the curriculum design and classroom instruction; any teacher should appoint the previous capacity of students.

According to teacher's view they find out the previews knowledge of each and every student by using different procedure and tools. There is a main theme of statements given by students as follows :

"Our teachers enter classroom and then they say the name of subject matter which were taught in previous class. After then they start new topic or problems without any linkage of previous class. They don't ask the things which were taught in previous class." (Students' view)

According to students; teachers only repeat previous lesson's topic without any linkage to previous knowledge of students.

According to the teachers' and students' response about the skill of teachers to measure previous knowledge of students are not mostly correlated. Hence, to find out the real situation of that skill of teacher, an episode is given below which was obtained from classroom observation:

Episode-1

First of all the teacher goes to the class and then researcher also enters the class immediately. All students stand up and say good morning sir, and then the researcher says good morning sit down. There are 49 students in a class. The desks and benches are not put in proper place. Also the size of them is not same. But the white board is in proper size. The classroom is cemented but it is dark; because there is not any window in front of the class. After some time the teacher starts the class only by saying the name of topics taught in previous class. He also doesn't ask to do homework. The topic of that class is'intersection of sets'. Teacher starts to solve question no.1 of the text book and students are asked to copy down the solution. He only describes about solution and students listen carefully.

Hence, according to the situation of observed class; the mathematics teacher has poor knowledge in about previous knowledge measurement skill of students.

So it can be concluded that teachers only thought that the review of the previous class topic's name is the way of finding previous knowledge of students. So that teachers does not have enough knowledge to connect previous lesson to that day's lesson.

4.2 Mathematics Teacher's Ways of Addressing the Need of Classroom Diversity (Gender, mental, ethnical)

The statements given by teachers are given as follows:

"We make different groups of students by including multi-ethnical and multi-able students and different activities are given to do in group."(Teacher's view)

"I ask different questions for students individually in isolations and help where necessary." (Teacher's view)

"We use different kinds of instructional materials which are used to address the needs of diverse students without any discrimination."(Teacher's view)

The statements given by mathematics teachers show that most of mathematics teachers used instructional materials and child centered method to fulfill the needs of diverged students. Teachers said that they often generated the feeling of justice, co-existence and equality among the students. According to them students are asked to do different activities in group.

Therefore, to give an equal opportunity to all students; group was divided depending upon the capacities of students and such group divisions could accelerate learning experiences of those students who were poor in mathematics. Also the girls involved in mathematics learning actively.

"We have determined sitting place of students in cyclic order and girls' and boys' desks are put randomly. Hence the groups are so arranged that where both boys and girls are in a group and questions are asked equally for boys and girls." (Teacher's view)

According to them, group division not only developed the learning experiences of the students' but it also developed group belongingness and established co-operation between boys and girls of lower secondary level which was very essential in diverse classroom for equal learning.

In this regard (Anthony and Walshaw, 2009) argued that students wanted to learn in a harmonious environment. Teachers could help to create such an environment by respecting and valuing the mathematics and the cultures that students bring to the classroom. By ensuring safety, teachers make it easier for all their students' to get involved. It is important, however that they avoid the kind of caring relationships that

encourage dependency Rather; they need to promote classroom relationships that allow students to think for themselves, ask questions, and take intellectual risks.

For true data of this research, teacher's view may not enough and reliable. Hence students' views have taken for more detail about the ways of addressing the needs of diverse classroom. The responses given by students are given as follows:

"Our teacher divides class in different group and each and every group is asked to solve problems. He/she also says to question where problems. Then he/she tries to solve it. But, because of huge group of students he/she can't give equal chances to address each and every student's needs." (Student's view)

According to the students, math teachers had made different groups in accordance to the mental ability of students and they were asked to solve different problems. Hence the teacher used student centered method mostly in this way every student takes part in problem solving effectively. This type of work had developed the student's creativity. But the number of student was too large. Hence in spite of well knowledge of classroom teaching learning environment, he/she couldn't take care of each and every student. Hence it might not address the learning needs of each and every student.

"Teacher divides different groups and asks to do different problems. He shows different kinds of materials to teach. But he/she doesn't take cares poor students." (Student's view)

Students said that teacher made group and they were asked to work different kinds of activities. They involved in different activities. But teacher's activities were not addressable to know the learning needs of diverse students because he/she asked question only for talented students. Hence these kinds of process can't carry an environment to fulfill the

learning needs of diverse students'. Any teacher should be consider that group activity is not all thing of total participation, each and every members of group involvement is enough thing to fulfill the learning needs of students who are diverse in a class.

In some cases, there may be improper relation between students' and respective mathematics teacher's data which carries mistake data from those resources. Hence data should be carried from real situation. Hence, here is an episode obtained from classroom observation which is given as follows.

Episode-2

First of all the mathematics teacher enters into the classroom and also the researcher enters immediately into that classroom. Then all student stand up and they say 'good morning sir' in a same voice. After then the researcher says,"Sit down." The topic of the class 8 was H.C.F. of algebraic expressions. The class is large because there are 38 students altogether. The desks and benches are put in well manner and all students become school in school uniform. Hence the class looks like genital and honest class. At that class students are asked to read and understand the first number problem of this exercise and then students do that. After sometime; some students show their solving to their teachers and the teacher gives feedback where necessary. Unfortunately, all students can't solve it and hence the teacher starts to teach this problem showing diagram of that problem with interaction between students. He shows instructional material but he can't establish relation between that material and related chapter. On the other hand, he does not want to know all students' capacity to learn that problem. Only he uses drilling and only named demonstration method. In this way students are taking part about that work but there isn't relation between instructional material and subject matter.

Whatever the teacher and students responded; regular class observation showed that teacher did not pay attention to the needs and interest of every student's. They taught on their own way. This carried reset that only forward and talented students were benefited and rest of the students could not get any knowledge from the classroom learning. Among the students; some were copying the other's writing without any solving ideas. Apart from that teacher used to scold the students when they asked even a general question.

These data showed that the teachers were not paying attention towards the violence and discrimination created in classroom. In this way the teachers hadn't suitable way to address the need of all kinds of students.

4.3 **Procedures for Addressing the Needs of Students' Identities**

There are different kinds of method in teaching learning process. Hence, mathematics instructional program is also affected by different methods. Teaching learning process is mixed form of knowledge and skill. Hence, there should be suitable relationship between contents and methods according to the nature of mathematics content or subject matter.

According to the teachers' and students' responses the teaching methods of mathematics teachers in teaching diverse students have been described below.

Figure No. 4.1: Views of Teachers in about the Used Methods

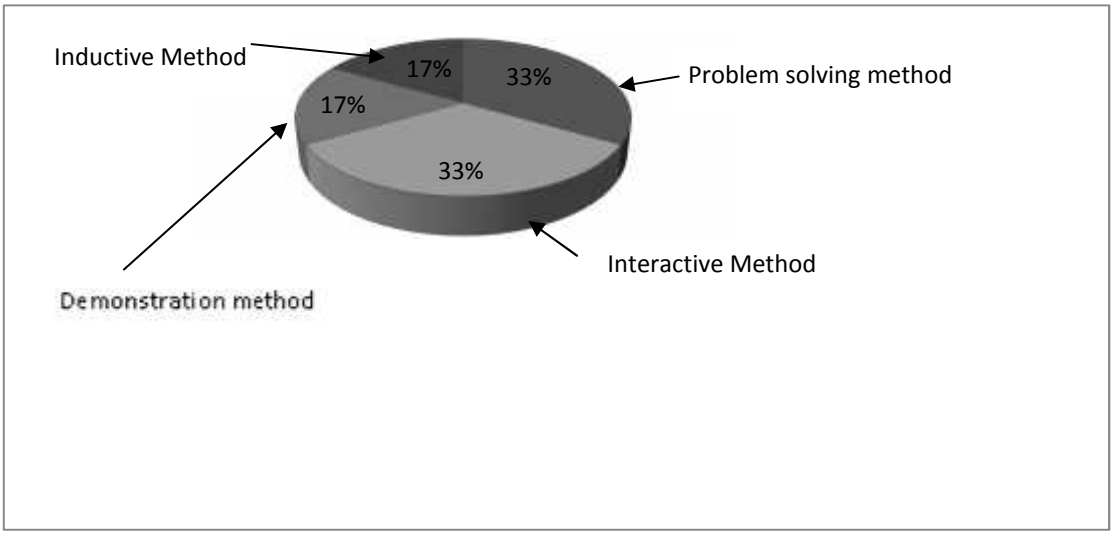
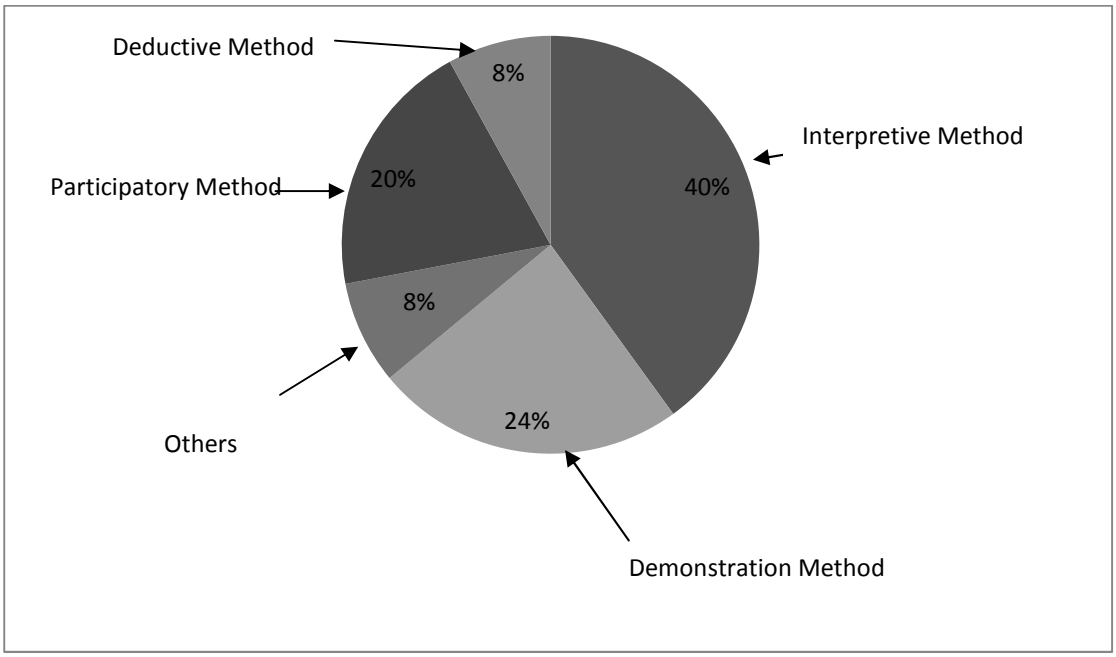


Figure No. 4.2: Views of Students about the Used Methods



The above figure 4.1 and 4.2 showed that in teacher's views the nearly all frequently used method was interactive method. Similarly 33% teachers said that problem solving method is helpful to fulfill the needs diverse students but student didn't say that. Most of the teachers (17%) said that they had used inductive method but all students claimed that their teacher hadn't used inductive method.

On the other hand 17% teachers argued that they had used demonstration method for visualization of mathematical concept, for which 24% students said that their teacher used this method. It is seen that teachers gave priority to interactive method, problem solving method, demonstration method and inductive method. But, students claimed their teachers gave priority in interpretative method, participatory method and demonstration method mostly.

Whatever the teachers and students responded regarding the used teaching method in classroom, it is seen that teachers are using

interpretative method mostly. Other methods like inductive, problem solving, demonstration method have given least importance.

4.4 Practice and Effort of Mathematics Teacher for Equal Participation of Diverse Student (gender, ethnical, and mental)

The real situation of classroom practice of math teacher for equal participation of diverse students is known and judged by the data obtained from teachers and students. Following are the responses of math teachers and students on how a math teacher makes all students equally participated in all classroom activities. As we visit, it is found that all teachers wanted to be conscious themselves and made conscious to their students for the class to be against the discrimination and violence that could be seen in classroom and with gender and intellectual balance.

Table No.4.1 Math Teacher's Ways for Involving Students in Teaching and Learning Activities

Student's response	%	Teacher's response	%
Encourage all in problem solving, firstly	40%	Involve in teaching activities by establishing balance environment	33.3%
Encourage all to participate in extracurricular activities	24%	Encourage to involve in teaching learning activities and extracurricular activities equally	16.6%
Contact individually with teacher	12%	Practicing in asking equal question in class teaching learning activities	16.7%
Group activities	12%	Involve in group activities	16.7%

Equal questioning	12%	Making students conscious about the discrimination in classroom and violence and themselves to be conscious	16.7%

According to above table, 33.3% teachers said that they had involved teaching learning activities by establishing balanced environment but 40% students responded that they were encouraged to solve problems firstly by their teachers. Teacher's also claimed that they encouraged students in teaching learning activities and extra-curricular activities, which are related to students' response. Teachers said that they (16.7% teachers') hat tried to ask question equally in classroom as far as possible. In this regard 12% students argued that they had built contact individually with their teachers. According to the 16.7% teachers, they were conscious in about the discrimination and violence in classroom. In group activities booth's views are correlated.

Regular class observation showed that the main way of the making class inclusive and participatory was only the use of interpretive method. Also the math teacher read problem and students were also asked to read and then copy the solution of that problem solved by their teacher.

Teachers had divided students' class in different groups but they had given less time for equal chance to learn in those diverse students classes. Hence, the appropriate use of teaching method in math class seems to be very weak.

4.5 Teacher's Awareness and Conscious about Bias, Discrimination and Violence

Potent violence, discrimination, prejudices and biases that seem in teacher's classroom effect the students' impression in learning. If teachers may not conscious about such type's violence, bias, discrimination in teaching that teaching is not meaningful. Hence any teachers should be

aware and conscious about bias, discrimination and violence which may occur in classroom activities.

"Our teachers teach mathematical problems effectively by using different methods and they help us equally to solve problems where we have made mistake."(Student's view)

From the view of students, mathematics teachers were teaching well without any bias and violence. For this they taught different subject matters by using different methods; according to the nature of those subject matters. For teaching difficult problems to students, teachers used maximum power to teach that problem effectively. This means, the teaching methods changed as per the topic. They said that their teachers neglected the violence and discrimination by paying attention to improve the mistakes made by students.

"Our math teachers sometime divide different groups and they give different instructional materials related to learning topic in each groups. Then we are asked to use these materials to solve mathematical problems. They also help us where necessary." (Student's view)

Student's reported that their teachers divided different groups and instructional materials were given to each group. Then students were asked to manipulate these instructional materials. This shows that sometime teachers use discovery method and experimental method as well which help to build strong image of new thing in students. They used both pure discovery and guided discovery method as well. These factors could minimize the violence, discrimination and partiality that became in classroom.

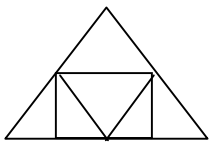
On the other hand 100% mathematics teachers claimed that they were conscious and aware in about bias, discrimination, violence and partiality in diverse classroom.

Anthony and Walshaw (2009, pg.25) agreed that the effective teachers developed and used sound knowledge as a basis for initiating learning and responding to the mathematical needs of all their students'. This shows that any teacher should see each and every student equally by participating them in every activity. So the students' did not see the discriminative and violence behaviors of teachers towards them due to the power, privilege and right of the teacher. Therefore, students gave their responses about the possible violence and discrimination that happened in the classroom which they responded as follows:

All human being want to be good person. So, they want to arise their good actions and behavior only. To know real situation of mathematics class, classroom observation were also conducted frequently. The classroom behaviors of both teachers and students obtained from class observation are given below as episode.

Episode-3

In the observed class of mathematics teaching, one day mathematics teachers enter the classroom with a cardboard model of triangle and daily used materials. The topic is 'sum of interior angles of any triangle is 180^0'. That class is divided into four groups and in each group, students are asked to make a paper model of triangle by showing triangle's model that was carried by teacher. After making triangle's model; students are asked to fold the corners of that triangle by showing as him as follows.



Then teacher says, "the three corners of that triangle meet at a point, hence the sum of interior angles of any triangle is 180^0".He does not give how it becomes 180^0. Students also do not ask any question about it. They only see towards their teacher without any response. At that time any participatory actions are not given to any groups.

Whether the teachers and students responded; class observation showed that teacher did not pay attention to the needs and interest of diverse students. Teacher had made different groups in accordance to fulfill different basis. But the division of group did not seen meaningfully. It means that they did not give any role of learning action to students. It may cause because of the knowledge and skill of teacher to manage diverse students' class. Hence, to avoid bias, discrimination, partiality, and violence any teacher should have the knowledge of Piaget learning theory and Vygotskey learning theory.

From the above views; it can be analyzed that teachers were not aware and conscious fully in about bias, discrimination and violence which may happen in diverse class.

4.6 Teacher's Perception on Hindrances to Teaching Different Kinds of Students

There may be different hindrances or obstacles which are faced by mathematics teachers. Hindrances faced by mathematics teacher in teaching diverse class are given as follows.

"We feel difficulty because of the mother tongue of students and ability of students who are different in term of language and ability." (Teacher's view)

Nepal is multi culture country. So here are many kinds of casts. Many casts have their own mother tongue. But we teach mathematics in lower secondary level in mainstreaming language. Hence, not only mathematics students felt nervous in math but also mathematics teacher felt uneasy and nervous. Because, they had many obstacles to teach mathematics in such diverse classroom.

"Low capable students do not want to participate in various activities. Therefore we feel difficulty in providing equal learning experience to all" (Teacher's view)

Classroom is taken as a miniature of a society; because here are many kinds of student's on the basis of cast or culture, economy, family status etc. which affect socialization of any students. Hence, students participate in different activities according to their nature and interest which differ in learning and effects equal learning opportunity. As a result; it had been difficult to manage the class and contradicts to give equal learning experience among students.

"Some students feel shyness and have low speaking automatically in spite of our practice to create equal involvement of all students in learning. (Teacher's view)

Some students' are that who don't want to talk anything because of shyness or other thing. At that situation; teacher can't take response from that students. So it affects equal learning in diverse classroom.

In this regard (UNESCO, 2003) states that at elementary level instruction through home language has psychological, sociological and educational strategies.

While discussing about above problems faced by mathematics teacher, any mathematics teacher should solve such types of problems on the basis of Piaget learning theorem. I.e. children's characters are guided by their age group. Hence any math teacher should know the causes of becoming such types of problems.

According to teachers' perception the main hindrances to teaching different students are mother tongue and ability of students, low participating habit of students in different activities, shyness etc. are mainly.

4.7 Mathematics Teaching Behaviors as Per the Need of Diverse Students.

Needs of students are varied from the diversity of students. While addressing the diverse needs of students; there are different things to be considered. Among them, teacher should be trained to fulfill the needs of diverse students. Different response were found by teacher which were obtained from teacher on the answer of the question that which kinds of teaching behavior are essential as per the necessity of diverse (gender, mental, ethnic) students.

"For a managed classroom in terms of different ways, we use different teaching methods which help multi-capable students to establish justice." (Teacher's view)

The above response showed that teacher's used different methods in accordance to the capacity of students. As there is vast diversity they can also use the philosophy that 'each one teaches one'. Teacher used different methods in a class as there is necessary. They had looked every student's equally without any bias.

"Training gives different ideas to perform suited mathematics teaching behavior. So we want effective teacher training". (Teacher's view)

Teaching is behavioral aspect. So it is related to skill. Many students thought that mathematics is boring subject. To remove such types of bad concept on students, mathematics teachers should have effective teacher training. Teachers claimed that training changed their teaching behavior because they can get many chances to score different ideas among different teachers.

"We want class performance in group by balancing different gender, cast, ability etc." (Teacher's view)

"Students are encouraged to take part in classroom activities and extra-curricular activities without any discrimination". (Teacher's view)

According to teachers' responses, they had created group in a class by balancing different casts, grader ability. Each and every group was given equal chances to take part in classroom activities and co-curricular activities. Teacher also claimed that they had made such types of group without any discrimination. They also responded that such types of group division helps the student's co-operative behavior which is essential for powerful and speed mathematics learning.

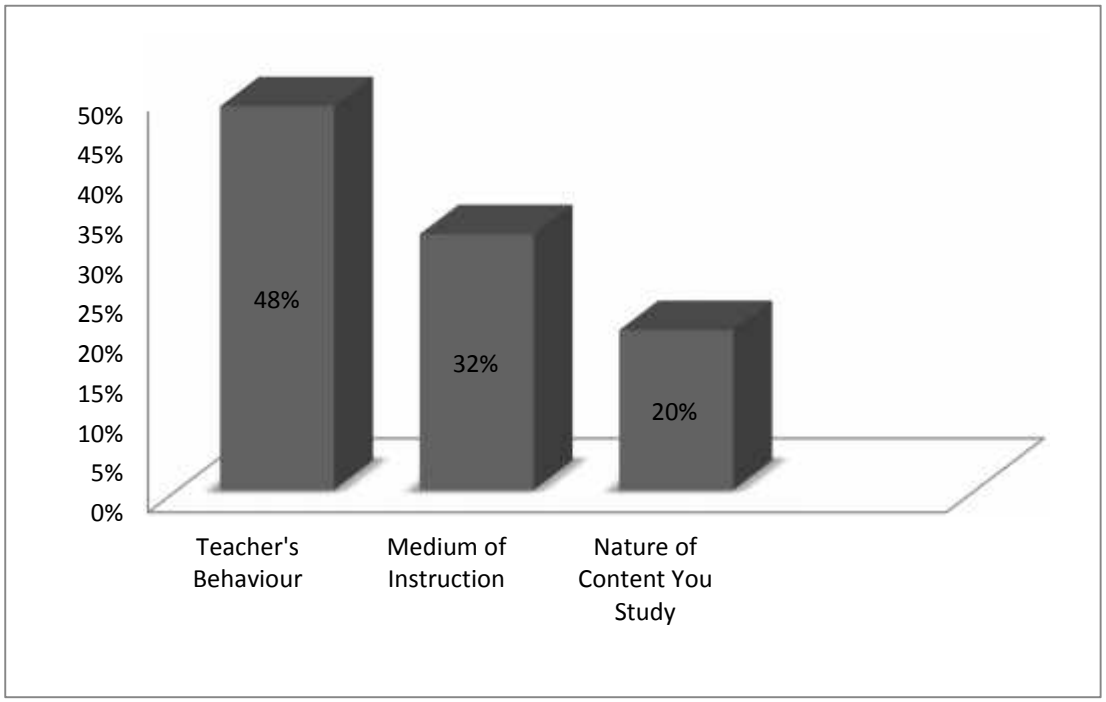
"Teacher should be extra talented person to manage diverse students (gender, mental, ethnic) classroom". (Teacher's view)

Teacher is thought as co-coordinator of teaching learning activities. In a class, there are different cast's students, different lingual students, different capable students. Hence teacher claimed that teacher should be extra talented or teacher should be able to mange diverse classroom. They should also be able to solve problem related to their subject matter. They also claimed that they should be able to establish good relationship among community.

In mathematics teaching behavior, (Anthory and Walshaw, 2009, pg.15) supported that for madding sense of a new concept or skill, students needed to be able to connect it to their existing mathematical understanding, in a variety of ways. Tasks that require students to make multiple connections within and across topics helped them appreciate the interconnectedness of different mathematical ideas and the relationships that exist between mathematics and real life.

According to Students' responses, following factors are seen for equal lelarning to students:

Figure No. 4.3 Factor in Achieving Equal Learning



The response obtained from students were analyzed and found that most of the student's .i.e. 48% said that they felt difficulty to achieve equal learning experiences in diverse classroom due to the different kinds of teaching behavior of teachers. Also 32% students claimed that they were suffered to get equal learning experiences because of the medium of instruction. Remaining 20% students said that they were not involved in teaching learning activities equally due to the nature of content which were studied by them were prepare without any consideration of student's.According to mathematics teacher's concepts, they had followed Vygotsky learning theorem and Piaget learning theorem.

From the above table, 48% students' claimed that they had not got equal learning experiences because of teachers' behavior. Other causes do not play vital role for equal learning experiences.

4.8 Teachers and Students Perception on the Problems of Mathematics Teaching

For responses of teachers of the question, 'What types of problems may the students feel in teaching and learning in mathematics class?' Following are the responses of the question given by mathematics teachers'.

"Problems of mathematics teaching in class are carried due to the different learning styles and quality of students where as teachers are facing comments in teaching." (Teacher's view)

"Problems of mathematics teaching are appeared due to the multi-culture, multi-lingual, multi-able students."(Teacher's view)

"Many problems in mathematics teaching are appeared due to the unsuitable instructional materials." (Teacher's view)

From the analysis of above teacher's views, it was seen that diverse students' diverse needs created problems of mathematics teaching. Because in a class all students are difference according to their capacity gender, ethnic, mental etc. which effect their learning capacity and style. Then the teaching behaviors of teachers are seen unsuitable for students. And, other cause, teachers hadn't perfect knowledge in about individual difference of student and Lack of suitable teaching materials as the main factors of mathematics teaching. They said that there were different kinds of students in a class. So their needs and interests were different. Then teacher should face problems which were seen in mathematics teaching. They also said that teaching materials of mathematics were less available and teacher might have problem for using teaching materials appropriately.

According to Piaget learning theorem; concrete operational periods children's can't learn effectively without suitable instructional materials. Also Vygotsky had claimed that students learn by social interaction on

his learning theory. Hence, social status of students should be considering. So, society is a factor of mathematics teaching.

Teachers claimed that such types of problems could be decreased if teacher understood the diverse needs of students and they used instructional materials appropriately. On the other hand; students had given their views on the problems of mathematics teaching which are given as follow.

"In mathematics teaching; problems are appeared due to the multi-culture, multi-able students." (Student's view)

"Mathematics teaching problems are also appeared due to the partial behavior of teachers."(Student's view)

"Teachers' vague language in some subject matters creates problems in mathematics teaching."(Student's view)

As given above, it was found from the views of students that almost students were from different community having different culture and also with different ability. So, for those students' cultural difference and mental different were the main cause to create problems in mathematics teaching. Also most of the students claimed that problems were created by discriminative behavior of teachers among students. Those types of behaviors of teachers didn't see all students equally and hence, it carried problems. Some students also claimed that their teachers were not able to solve all problems which carried problem in mathematics teaching. Hence, in accordance to students' diverse needs, discriminative behavior of teachers and lack of qualified teacher in all subject matter were the main causes to create problems in mathematics teaching.

Along with the views of teachers and students; some facts were collected from direct class observation which had given in following episode.

Episode-4

It is in the observed class of mathematics teaching. One day, teacher enters into classroom with a numbers table from 1 to 100. Then he reviews previous lesson with the help of some question and interaction with students. Then, he writes that day's topics. The topic is prime and composite number of class-VI. Then he first of all says the meaning of prime and composite numbers in deductive method. Then, students are asked to write numbers from 1 to 100 and say to imite him. They are asked to round no.1 and say 1 is neither prime nor composite no. Then they are also asked to leave 2, 3, 5 and 7 and cut the multiples of them respectively. Finally, he says the cut numbers are called composite numbers and remaining numbers are called prime numbers. At last, he asks some question about prime and composite numbers for some in front side students who were seen as talented students. At that time the teaching method is totally teacher centered and he neglected backward students.

Whatever the responses of teachers and students might be; it was seen from the direct class observation that teacher oriented method and lecture method were used in teaching which were full of partiality. Teacher had not motivated their students in teaching learning activities. Some partiality and bias could be seen in classroom teaching. It was all only to pass the time. Students were not motivated toward education. Students were only passive listeners and imiters.

From the obtained data; teachers were not dedicated towards their profession because they seemed that they had been trying to pass the time. These all activities showed that, diverse students (gender, mental, ethnic) were facing problems in mathematics teaching.

Hence teachers' discriminative teaching behaviors, diverse needs of diverse students, lack of qualified teachers are the main problems in math teaching.

4.9 Psychological Knowledge of Mathematics Teacher

To know the psychological knowledge of math teacher, it has been analyzed in two aspects which are given as follows:

i) Teacher's motivation power toward students and

ii) Teacher's teaching behavior according to child psychology

i) Teacher's motivation power toward students

To know the math teacher's motivation power toward students; a direct class observation was conducted which is given in the following episode:

Episode-5

It is in the observed class; one day teacher enters the class with daily used materials and geometry box. The class is VII. First of all teacher reviews previous day's class and links that days class by writing the topic of that class. The topic is the characteristics of parallelograms. Some students are interested but almost students seem to be nervous or lazy. Teacher does not motivate students. He starts to make parallelograms with the help of marker and geometry box materials. Then students are asked to imite him. Many students feel uneasy because the teacher scolds them by using bitter words. Finally, characteristics of parallelogram are written by measuring the components of that parallelogram.

From direct class observation most of students were feeling boring but teacher didn't watch towards them. Hence it could be analyzed that teacher did not have motivation power to students as desired.

To support this point (Anthony and Walshaw, 2009) argued that teachers needed a grounded understanding of students as learners to teach

mathematical content effectively. With such understanding, they were aware of likely conceptions and misconceptions. They used this awareness to make instructional decisions that strengthen conceptual understanding.

ii) Teacher's teaching behavior according to child psychology.

The lower secondary level's students are of age group 10/11-12/13 years mostly. The characters of this period are described on the basis of the following theory.

Piaget has divided human's intellectual development into four periods. They are; sensory motor period which appears in child from the age 0-18 months. The second period is pre-operational period which appears from the age 1.5-6/7 years. Third development period is concrete operational period which appears from the age 6/7-11/12 years. Finally, the last period is formal operational period which appears from the age 11/12 years to above. According to Piaget; most of lower secondary level's students are of age concrete operational period and that period's students are to be taught by using teaching materials firstly. According to him concrete means starting point for operation is a real system objects and relations (Pandit, 2061).

From the direct class observation; It seemed that teacher didn't used models of parallelograms. He only used geometry box to construct parallelograms which was not necessary for that level. He also used teacher oriented methods and neglected students question and inquiries. So, teacher had neglected the characters of late child hood period and concrete operational period's students.

According to obtained data, students were scolded frequently. They didn't use concrete materials. Hence it can be said that teachers had less knowledge towards child psychology.

4.10 Ways of Providing Equal Learning Experiences for Diverse (gender, mental, ethnic) Students in Mathematics Learning

Different hindering factors affect to provide equal learning experiences for diverse (gender, mental, ethnic) students in mathematics learning. (Anthony and Walshaw, 2009) found that students needed opportunities to work both independently and collaboratively away from the demands of the whole class for knowing the mathematical ideas equally. With this reference the following views are given by teacher for the question that what should be done to provide equal teaching learning experiences to diverse students:

"We want multi-ethnic and multi-lingual curriculum which may improve diverse students' needs." (Teacher's view)

"Teacher training is essential which must be helpful to change in entire environment of school."(Teacher's view)

After the analysis of the above view; teacher claimed that equal learning experiences could be provided by referring multi-ethnic and multi-lingual curriculum instead of centered curriculum. They also focused that teacher training should be given to create the change in entire school environment.

"Teachers should have skills to use appropriate teaching methods. Also teaching materials should be collected and used by considering the needs of ethnicity and culture of students."(Teacher's view)

A few number of teachers forced that teacher training should be provided for establishing justice and fulfillment of diverse students' needs. Some teachers stressed that teacher training should be given for choice of instructional materials and develop the skills to use these materials appropriately.

In the same way, following are the views of students.

"We want teachers use reinforcement, motivation and students centered teaching methods in order to build a democratic class." (Students' view)

According to above students' view; reinforcement and motivation play vital role for equal learning experiences. Hence, teacher should be well informed about the uses of suitable reinforcement and motivation for learning. Also the students claimed that equal learning experiences in classroom could be gained by using student's oriented teaching method. So each and every teacher should use student centered methods by involving students in different activities. Another factor to build equal learning experience is democratic class. Students said that democratic class could develop the environment to express internal desires to each other. Hence, according to student's; motivation, reinforcement, students centered teaching methods and democratic class are most important factors to give equal learning experiences in classroom.

"Teacher should focus backward students; like as girls and disable in teaching learning activities." (Student's view)

From the analysis of students view that for equal learning experience girls and disable students should be focus in teaching by giving extra activities to them because girl's students are less interested to learn mathematics.

"Curriculum and educational materials should be based on multi-lingual and the teacher should play role of facilitator."(Student's view)

According to students view curriculum should be changed and improved as multi-ethnic and multi-lingual. Also the other educational materials should be changed in accordance to diverse students' needs. Furthermore, the role of teacher should be only of facilitator but not of as decision maker. Then the students could get equal learning experiences. If the above described things were applied in classroom for effective

teaching and learning; then the students could get equal learning experiences in classroom.

But the regular class observation showed that teacher was unable to give equal learning experiences while teaching in class. Because, teacher hadn't managed diverse student's needs. For example; while solving problems; teacher just wrote on whiteboard and students were asked to copy it. The teacher hadn't evaluated student equally because they asked partially or they ask question only for talent student. They scolded the students in class if they didn't know and make noise. There was less interaction between teacher and students. They only used lecture method. Most of the class time; students were in the fear mind because of the scolding of teacher.

Hence, equal learning experiences could be given by following the ideas which are given here.Curriculum should be related to the diverse needs of students, trained teacher and sufficient teaching materials should be available, teachers should focus backward students and reinforcement, motivation etc. should be given to provide equal learning experiences for students.

Chapter: V

FINDINGS, CONCLUSION AND RECOMMENDATIONS

After analyzing and interpreting the data, the researcher has tried to draw findings conclusions and recommendations which may be helpful for future study. The findings and conclusion are drawn on the basis of this research's data analysis and recommendations were presented on the basis of findings and conclusion of the study.

5.1 Findings

This study had three objectives. The first objective was to find out the real situation of mathematics classroom in lower secondary level. On the basis of these objectives, data were collected and analyzed. After analyzing the data related to this objectives; main finding are given as follow:

- Most of the lower secondary mathematics classes were crowded.
- Mathematics teachers hadn't enough knowledge about child psychology.
- The school community was multi-cultural, multi-ethnic, multi-economic conditional which affect mathematics class.
- The mathematics class environment was controlled by teacher but there was no discrimination in treatment in terms of gender, ethnicity and mental ability in class.
- There was no class of mathematics teacher with lesson plan.
- Classroom teaching performance of mathematics teachers with few teaching materials. Some of which were irrelevant to subject matter to be taught.
- In some schools sitting places of students were managed in cyclic order which may be fruitful for most of the students in class.

- Improper classroom for achieving equal learning experiences of diverse students' mass.
- Lesley connected classes with previous lesson.

Another objective of this research was to explore diverse (gender, mental and ethnical) students' classroom management skill of math teacher through pedagogical practices:

- Students had felt inferiority, shyness and fear in school which reduces proper class environment.
- Teachers had less knowledge to mange diverse class which may cause bias, violence and discrimination in class.
- Mathematics teachers had been using traditional teaching methods in spite of child centered methods.
- Teachers had poor skill to connect that day's manner to previous lesson.
- Interpretive method, interactive method, demonstration methods were used frequently.
- All students were not involved in classroom activities equally.
- Mathematics teachers hadn't suitable way to address the need of all kinds of students.
- Teaching learning activities were conducted in group but the talented students were evaluated frequently.
- Balanced environment as the most important factor of classroom teaching and learning.
- Poor students were scolded on their mistakes in some mathematical problems.
- Some practices were seen to establish social justices for equal learning experiences.

- Most of the problems of mathematics were done by teachers themselves which may reduce the practicable habits of students.
- Mathematics teacher's behavior such as; the natures of teacher medium of instruction etc. play vital role for classroom management skill of teacher.

The last objective of this research was 'to recognize the learning needs and real mathematical stage of lower secondary level diverse students'. The major findings associates to these objectives are given below:

- Students had different mother tongue which affect the students to understand the difficult problems of mathematics.
- Low capable students didn't want to participate in different activities.
- Students wanted different ways to learn in accordance to their mental ability, cultural background which carry problem in mathematics teaching.
- Boys wanted to learn mathematics than girls.
- Curious students wanted to learn mathematics by doing or solving different problems themselves with the help of teachers.

5.2 Conclusion

In our country's context, teaching is very challenging because our classes are diverse in accordance to ethnicity, gender and mental capacity of students. Hence, for meaningful mathematics teaching learning activities, it is essential to explore suitable teaching method and materials which help to fulfill the diverse needs of diverse students. Hence, teacher should be near to each and every student's culture and community. They should also nearer to students like as facilitator and friend. Extra-curricular activities can be conducted to involve each and every students

and for equal learning. Hence, school should manage such types of extra-curricular activities. Teacher training should be provided for every teacher which helps them to teach effectively by using appropriate method, use instructional materials suitably.

It seemed that as per the students' identities and different learning styles; mathematics teachers were not trained, updated. So that violence, bias, partiality seemed naturally. In mathematics teaching; teachers asked students to solve problems but the attention toward the backward students was not given. Also girls were less interested to learn mathematics than boys but teachers weren't conscious about it. On the other hand, mathematics teachers created groups for group teaching but they took care only for talented and forward students. Such types for teaching behaviors of teacher carry the discrimination and poor and backward students aren't benefited.

5.3 Recommendations

Any actions have strength and weak points. The week points should be avoided by following recommendations for related level. The main recommendations of this research are given as follows.

- Government should provide appropriate number of teachers in school in accordance to the number of students.
- Math teachers should be trained to know child psychology and all aspects of teaching.
- Teaching learning activities should be so conducted in accordance to the diversity of students.
- Supervision should be conducted by DEO and other authentic parts of MOE.
- Schools should provide teaching materials for teachers and teachers should also use teaching materials.

- It is necessary to find out the needs of multi-ethnic, multi gender and multi-able students' and for this different kinds of researches are essential.
- Mathematics teacher should be good knowledgeable in respective subject matters. For this, government should select teachers with the help of free completion.
- Child centered method should be used in teaching learning with the help of teaching materials.
- Teachers should think and see every student equally without any bias, discrimination and partiality.
- The curriculum of mathematics should be made relevant to the everyday's needs of diverse students (ethnical, mental, gender).
- It is essential to find out the learning needs of multi-ethnical, multi-cultural, multi-able students and different kinds of research are essential.

This is a study in about pedagogical practices of mathematics teacher in Lower Secondary level. The finding and conclusion carried from this study can't be generalized in all schools. But it could be helpful to improve all teachers' pedagogical practices. There are some issues not answered from this study and need further study for the validation of this study. These issues are as follows:

- Comparable study of pedagogical practices of math teacher between in boarding school and community school.
- Comparable study of pedagogical practices of math teacher between in rural and urban schools.

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Appendices

Appendix-1 (0-10) Minutes

Teacher Activities

- Only talented students were asked to solve given problems coming before the class.
- Home works were not checked details.
- Punishment was given being based on the homework done by finding students randomly.
- Groups of students were divided according to the capacity of students.
- Main priority was given to the students who corrected problem first.
- Backward students were not encouraged to take part in learning effectively.
- Asking the formula.
- General punishment to the poor students.
- Only the definitions and characters of previous lesson are given.
- Reward and punishment.
- Encouraging all students in classroom activities.
- Equal behaviors were seen to all students.
- Teachers were bias in asking question.
- Students felt nervous because of the fear of teacher's scolds.
- Some words spoken by teachers were not suitable in diverse class.

Appendix-2 (0-10) Minutes

Student's Activities

- Some were conscious in about previous lesson.

- Some talking each other.
- Some were busy in their own action.
- Some were discussing about previous lesson.
- Backward students were busy to copy without understanding.

Appendix-3 (10-30) Minutes

Teacher's Activities

- Students were asked to be conscious about that days content by teacher.
- Students were asked to see and read given problems.
- Solving the problems by writing on whiteboard.
- Formulae were written on whiteboard without any linkage with daily life.
- Discussion only focusing on talented students.
- Discussion with related content matter.
- Problems were solved by showing some teaching materials.
- Solved problems were discussed only with talented, boys and high cast students.
- Teacher showed unfit table behavior for mistake of students.
- According to intent of the course class was initiated.
- Problems were solved equally for all students.

Appendix-4 (10-30) Minutes

Student's Activities

- All were busy in discussion.
- Some were only copying others writing on problem solving.
- Some talented students were asking question for teachers for their strong learning.
- Talented students were busy is solving and poor were busy in copy.
- Poor, students were feeling nervous.

- Girls were Lesley active in teaching learning.
- Teacher did not care the students' variability.
- Students presented to be understood due to teachers fear.

Appendix-5 (30-45) Minutes

Teacher's Activities:

- Evaluation was conducted on only talented students.
- Teachers did not evaluate all students.
- Homework was assigned.
- Teacher's questions were not friendly to students according to child psychology.
- Those students who didn't solve problems were neglected.
- Talented students were called in front of class to solve problem in whiteboard.
- Same problem was given to all students.

Appendix-6 (30-45) Minutes

Student's Activities

- Mentally forward students were busy in questioning teachers and giving answer.
- Backward students were copying others solution.
- Some students were scolded and punished due to the unsuccessful in evaluation.
- Backward students were not helped by teachers.

Appendix-7

Sampled Students and Their Respective School and Class

S.N.	Students' Name	Class	School's Name
1.	Kushal Adhikari	6	Shree Rameshwor Higher Secondary School, Mamling-6
2.	Puja Basnet	6	
3.	Samir Subba	7	
4.	Sunil Poudel	8	
5.	Chunu Magar	8	
6.	Sapana Lamsal	6	Shree Saraswati Higher Secondary School, Chainpur-10
7.	Raj Kumar Limbu	7	
8.	Sirjana Dangi	7	
9.	Ramesh Khadka	8	
10.	Sunita Shrestha	8	
11.	Sudip Tamang	6	Shree Sharada Higher Secondary School, Chainpur-16
12.	Prashwan Khadka	6	
13.	Sabin Rai	7	
14.	Juna Bhandari	7	
15.	Rubina Shrestha	8	
16.	Yogesh Adhikari	6	Shree Sharada Lower Secondary School, Mamling-2
17.	Yam Bahadur Bishwakarma	7	
18.	Parikshya adhikari	7	
19.	Madhav Ghimire	8	
20.	Manju Bhandari	8	

21. 22 23. 24. 25.	Kishwor Adhikari Milan Jimi Kamala Jimee BHagawati Bishwakarma Saroj Katuwal	6 6 7 8 8	Shree Lower Secondary School (Rukmani Bhawan) Phaksi, Aankhibhuin-2

Appendix-8

Sampled Mathematics Teacher with Their Respective Schools and Class

S.N.	Teachers' Name	Math Teaching Class	School's Name
1.	Bhim Prasad Pokhrel	6 and 7	Shree Rameshwor Higher Secondary School, Mamling-6
2.	Mohan Goutam	6,7 and 8	Shree Saraswati Higher Secondary School, Chainpur-10
3. 4.	Shyambabu Goutam Indra Kumar Bogati	6 7 and 8	Shree sharada higher secondary school,chainpur-16
5.	Mahesh Kumar Majhi	6,7 and 8	Shree Sharada Lower Secondary School, Mamling-2

6.	Man Kumar Thapa	6,7 and 8	Shree Lower Secondary School (Rukmani Bhawan) Phaksi, Aankhibhuin-2

Interview question for students

(1) In your mathematics class, if your teacher only uses one language. Do you feel comfort in about it?

(a) yes ☐ (b) No ☐

- If no, what do you except from your teachers and school?

…….

…….

(2) Does your teacher ask any question from previous lesson?

(a) Yes ☐ (b) No ☐

- If yes, how does he link it to that day's lesson?

……

…….

(3) Which method does your mathematics teacher always use mostly?

……

……

(4) How often does your math teacher involve in math's learning activities?

(a) Usually ☐ (b) Never ☐ (c) Lesley ☐

- If yes, which activities does he provide?

(a) Provides to correct my mistake. ☐

(b) Gives different goods. ☐

(c) Encourage me to involve different other activities. ☐

(d) Says thank you. ☐

- If not, how does the teacher respond when you ask question?

(a) When I question he/she becomes angry. ☐

(b) He/she doesn't care my question. ☐

(c) He/she punish me for my question. ☐

(d) I don't feel comfort questing in teacher's language. ☐

(5) How does your teacher listen to all students' voice?

……

……..

(6) What do you think about mathematics?

(a) Difficult subject ☐

(b) Interesting subject ☐

- If you think difficult, why do you think mathematics as difficult subject?

……

……..

(7) Does your math teacher help while you are in difficulty for learning math in class?

(a) yes ☐ (b) No

- If yes, what kinds of helps does he provide?

……

……..

- If no, why doesn't he/she help to you?

……

……

(8) How does your teacher provide equal learning experiences?

(a) Equal questing ☐

(b) Participating students in extra-curricular activities. ☐

(c) Encouraging all students in problem solving. ☐

(d) Establishing equal relation to all students. ☐

(e) Group activities. ☐

(9)How may be mathematics class effective?

(a)Teachers' behavior

(b)Medium of instructions

(c)Nature of content which you study

(10)In your opinion what may be the problems in teaching math?

……

……

……

……

……...

OBSERVATION FORM

Math teacher's name/address:-

……..

Class:-…….....

Date:-…….

Period:……

S.N.	Time interval	Teachers' activities with major behaviors of teacher guided by their psychological knowledge and others	Students' activities
1.	0-10 Min. Introductory Phase		
2.	10-30 Min. Main teaching phase		
3.	30-45 Min. Evaluation phase		