

CHAPTER-I

INTRODUCTION

Background of Study

In this contemporary world, education system are under change to teach new skills and competencies to all students, and to function under increasing financial constraints brought about by changing economic circumstances. The effectiveness of school to meet these challenges is being questioned by politicians, business leader and academics worldwide. And, effective teaching learning process is necessary part of an effective school. Without effective teaching learning process, no schools become one of the important themes of world's education to maintain educational quality and educational standard.

In the context of Nepal, mathematics is one of the major subjects in the school education. Most of the students of school are not able to pass mathematics. Recent years has seen a good deal of concern with making teaching and learning more effective. There is now a substantial body of information about effective teaching and learning, coming from a number of studies in the west. The last three decades of 20th century have several major initiatives in the fields of educational reform (Holts, 1994). But it does not impact in the ratio of our expectation.

Effective school research first appeared in late 1970s and had developed in 1990s. American schools are used as a framework to judge how the school is effective as curriculum alignment and organization, school wide professional development, emphasis on basic skills instruction, high students expectations and standards, maximizing learning time, active, stable, competent leadership, clear goals, collaborative , planning and collegiality, students involvement in school organization, safe school environment and parent involvement.

Effectiveness is broad term which cannot be defined exactly in one word. There are several criteria for an effective school. John Macbeath and Peter Mortimore (Subedi, 2005) have been describing the following characteristics of effective school:

- i) Professional leadership,
- ii) Shared vision and goals,
- iii) A learning environment,
- iv) Concentration on learning,
- v) Climate of high expectation for success,
- vi) Positive reinforcement,
- vii) Monitoring progress,
- viii) Pupil's right and responsibilities,
- ix) A learning organization,
- x) Home school partnership.

Thus, effective school has multidimensional features which directly influence teachers, students, and all other stakeholder.

In Nepal National Centre Educational Development (NCED, 2007) has suggested the characteristics to categorize the school as effective an effective school are: well physical infrastructure of the school, reasonable number of students, adequate teaching learning materials, room organization and management, commanding and professional leadership, high students achievement, maximum teachers and parent's interaction, learning environment, purposeful teaching, and school as learning organization. So, NCED gives wider view on effective school regarding on teaching learning environment, physical infrastructure and teachers quality.

In our context, there is higher failure rate in school mathematics. It is due to instructional aspect of mathematics. The effective mathematics classroom demands well management classroom, students' opportunities to solve the problem and appreciate pedagogy. Bishop, et.al, (2004) found that following are the main elements of effective mathematics classroom as:

- i) A focus on the learning of mathematics as the key goal, for staff and students;
- ii) The sharing of ideas for teaching mathematics;
- iii) The quality of mathematics training and development of the staff,
- iv) am work in teaching and in professional development;

- v) Using outside experts as facilitators;
- vi) Regular compulsory mathematical professional development;
- vii) Accountability for the quality of mathematics learning and
- viii) Creativity and risk –taking.

It shows that collaborative learning among students, teachers and school administration should be fully responsible for effective mathematics classroom. To make the effective mathematics classroom teachers is more responsible so teachers must have strong background in mathematics adept in instructional, knowing and caring for the students, classroom management.

Effectiveness is still a very personal affair. It is more technical and difficult task. Various educators have given their models about the effectiveness of mathematics teaching and learning. Among them , Per Rott (1982) suggests that pupils show knowledge and understanding, skills and attitudes intended by the curriculum as measured by performance on tests, pupils exhibit independent behavior in learning curriculum content, pupils exhibit behavior which indicates a positive attitude towards teachers and peers, pupils exhibit behavior which indicates a positive attitude towards the curriculum and the school, pupil exhibit behavior attitude towards themselves as learners, pupils do not exhibit behavior problems in class, pupils seem actively engaged relevant material while the class is in session are the indicator of effective teaching.

In considering effective teaching and learning, we need to look at the contents of what we teach as well as the way in which we teach it. Teachers also need to look more widely at what is needed for the future by today's children. A great deal of recent research has looked at effective teaching and learning but effectiveness is still a very personal affair. A teacher can do all the things suggested by research and still not succeed, or go his or her own way and succeed very well. Effectiveness is not only a matter of working in accepted ways but also a matter of personality and personal style.

Brophy and Good (1986) who suggested that there were five conceptions of the effective teachers which are possession of desirable personal traits, user of effective methods, creator of a good classroom atmosphere, master of a repertoire of

competencies, professional decision maker who has not only mastered needed competencies but learned when to apply them and how to orchestrate them.

Teaching is very technical profession in the twenty first century. The teachers is involved in the wider professional setting of the school and also more generally as a professional educator. This means working to keep up with what is happening in education and seeing whether research findings and knowledge of how children develop and learn have any relevance to the classroom situation.

In our context, maximum effective school researches are done in Kathmandu Valley. Research on effective mathematics teaching learning is the demand of present mathematics education research in all over the country so this study was take the location of Terai area in Dhanusha district where it is difficult to find the effective school. The achievement level of students' in mathematics of this district is poor so, this situation call for this research.

The focus of this study is students, teachers and school. Here this study was tried to investigate the students related factors, teachers related factors and School environment factors for effectiveness of mathematics teaching and learning which if very urgency of study in our present situation.

Statement of the Problem

School effectiveness is buzz word in the sphere of Nepalese educational system due to the higher low success rate in school education. Although the progress on making effective school is not found. Mathematics teaching learning is directly related to school environment and policies. In mathematics, students' outcome or performance depend on teachers' quality, school environment and motivation. Effective school has feature of professional leadership, purposeful teaching, share vision and goals, high expectations of all learners, accountability, learning communities and focus on teaching. To minimize low success rate in mathematics it need to be effective mathematics classroom where the students are learning effectively, collaborative, enthusiastic manner. This research enable to give the answer of the following research questions:

- How the instructional strategies are helpful for teaching learning mathematics effectively?
- How characteristics of mathematics teachers and students effect in mathematics teaching and learning?
- Why classroom environment is helpful for effective mathematics teaching and learning?

Objective of the Study

The main aim of this study was to find out the effective teaching learning practice of mathematics classroom. The other objectives of this study are mentioned below.

- To find out the characteristics of mathematics teachers in the effective mathematics teaching learning.
- To identify the students characteristics of effective mathematics classroom.
- To explore the characteristics of effective schools in teaching learning mathematics.

Significant of this Study

This study tried to find the practice of effective mathematics classroom so it reveals that the result of this study is applied in making effective mathematics instruction, to develop the vision and mission for effective instruction. Finding of this study is also helpful for school administrators, teachers, students, researchers, curriculum designer and other stakeholders related to education. The significant of this study are as follows:

- This study is helpful for school administrators to develop clear vision for effective mathematics instruction.
- This study is helpful for mathematics teachers to develop ideal classroom practice.
- This study is helpful for educational planer for planning the effective school.
- This study is helpful for future study in this area.

Delimitation of the Study

Every study has its limitations in terms of time, cost and resources. So this study also had the following delimitations:

- This study was conducted in only one government school of Dhanusha District.
- The school was selected by researcher convenience.
- Only one class of secondary level (class ten) was observed.
- Researcher spent only three weeks in school.

Definition of Operational Terms

In this study, the researcher has defined the following terminologies as:

Effective school: Those schools were high expectation for success, high achievement of students, instructional leadership opportunity to learn, safe and child friendly environment, positive attitude of society towards school.

High Achiever: Students whose score is more than 60 percent in final examination.

Public School: Public school are those school which are directed by government, fully funded by the government and with the help of local community.

Effective Mathematics Teaching: Effective mathematics teaching is refer to "the classroom practices in which students can understand the subject matter clearly and get higher marks in an examination".

Factors: In this study factors refers to the factors responsible to effective mathematics teaching learning which are categories into teachers factors', students factors' and school factors.

Characteristics: It means teachers, students and school characteristics.

CHAPTER: II

REVIEW OF THE RELATED LITERATURE

Review of literature is an essential part of research. The purpose of reviewing related literature are – Refining the research problem, developing significance for the research, identifying methodological techniques, methodological contradictory findings and developing research hypotheses. Gay et al., (2006); the review of related literature involves the systematic identification, location, and analysis of documents containing information related to the research problem.

Empirical Review

Jackson (1990) argues about how children are bound to follow the classroom rules. According to him, that school has certain rules and regulations, which have been followed by all in order to run school systematically. He further says, it curtails the right of an individual child. For example, school uniform is compulsory for all children. It shows that powerful people prepare rules for voiceless people in the name of discipline. And students are supposed to follow well defined rules in his/her classroom. Several rules such as no side talking, do not interrupt others during the discussion, raise, and the hands for asking question.

Similarly, he found classroom as complex and dynamic work place (Berliner 1989, cited by Subedi, 2005). The executive foundation of teaching speeds that teachers are not executives but they should have borne those responsibilities. He further noted that most of the teachers were only aware of motivation and evaluation on the classroom teaching learning process. While on the process of conducting the better classroom the teachers should care about planning, setting, goals, activities, favorable environment and communication. Similarly, teachers' professional capabilities and dedication on their job play the vital role for teaching learning. Students learning style and new technology on education has contributed on pupil' learning and achievement.

Proudford and Baker (1995) have described the characteristics used of American school as a framework for judgment. These characteristics and a description of representative practices reported in the literature as following:- Curriculum

alignment and organization, school-wide professional development, emphasis on basic skills instruction, high students expectations and standards, maximizing learning time, active stable, competent leadership, clear goal, collaborative planning, students involvement in school organization, favorable students-teachers relationship, safe school environment, Parent involvement.

Darling-Hammond and Ball (1998), in a review of research and practice in teachers' education, found that reform strategies in schools that did not make substantial efforts to improve teaching were less successful than those that did substantial efforts. Further, they found that teachers who spent more time studying teaching were more effective overall and "strikingly so in developing higher –order thinking skills"

Martin et al., S (2000) study of school effectiveness, using TIMSS data found that teaching experience, was not a significant factor in students' achievement except in Singapore and the United states. However, as Abbott-Chapman et al (1990) note, more experienced teachers tend to be promoted out of the classroom and into administrative positions. Teachers experience may, it could therefore be argued, manifest itself in other contexts within the school.

Acharya, S. (2000) in her article entitled "A theme paper as a part of the Education Sector Review" summarized the school effectiveness literature on which the following conditions can be found.

- I. Purposeful teaching exists in a school where the curriculum is flexible enough to meet the local needs.
 - A variety of teaching techniques are in practices.
 - Teachers modify and adapt teaching style to address the varied learning styles of the students.
 - Teachers have a clear and efficiently organized lesson pass.
 - The school mobilizes senior students to provide additional tutoring to junior grades.
 - There is a higher order teaching i.e. development and promotion of creativity, analytical skills, ability to seek information and inquiring mind through more participatory and child centered teaching methods.

II. Maximization of learning time is effective for a school when

- A reasonable load of homework is introduced.
- A frequent and continuous students' assessment is practiced.

Barbara M. Taylor, P.David pearson, Kath leenf.Clark and Sharorwalpole (1999) research indicates a combination of sound building decisions, such as the collaborative model for reading instruction, and effective classroom practices contributed to success also in our most effective schools. This research also found the strong relationship between school effectiveness and teachers communication with parents

Based on research and consultations with parents, the Act council of associations has identified nine characteristics of effective school. They are as follows:

- i) Strong and professional teachers,
- ii) Strong and professional principal,
- iii) Clear positive philosophy,
- iv) Environment conducive to learning,
- v) Effective students welfare system,
- vi) Strong organizational frame work,
- vii) Meaningful assessment and reporting students' progress,
- viii) Support for parent and community participation.

Karki (2001) did research on "A Study on Classroom Practices in the Primary Schools of Nepal in relation to the environmental education". The purpose of this study was to gain understanding on the classroom practice of grade four environment education subject in Nepalese public primary schools. It also tries to explore factors that influenced classroom practices and ways to improve them. Data were collected through interviews with subject teachers, observations of classroom, practice in selected school and document analysis. It was found that the classroom practice were influenced by various factors related to teachers professional skills, academic background, training, educational policies, content and activities given in the textbook. This study concludes that environment educational classroom practices in grade four of selected public primary school were not concluded satisfactory due to

lack of motivated and efficient teachers, availability of required resolves of effective educational policies.

Thapa (2005) conducted a research on 'Mathematics Classroom Management at Primary Level in Kathmandu Metropolitan ' showed that classroom management plays a vital role to achieve the goals, which is an important part of school management. Mathematics is a way of thinking, organizing, analyzing and synthesizing a body of knowledge. So, mathematics learning depends upon active participation creativity discovery, interaction and safe peace environment of students for meaningful learning resource management and discipline management. These aspect were used for the research on mathematics classroom management at Kathmandu metropolitan for primary school.

Subedi (2005), studied on "Mathematics Learning Management in an Effective School". A case practice in Nepalese school concludes that physical management, material management and activity management are key point of mathematics learning management. Teachers and their teaching methods are not only the factors for high achievement in mathematics. Overall learning management of schooling contributed for the high performance in mathematics included stimulating school's physical environment, high expatiation of success, head teachers supervision, qualified teachers, lecture and practice method, extra book for practice, emphasis on class work and homework, extra classes for low performance students and parent involvement in mathematics learning were the practices in effective school.

Neupane (2007), studied on his research on "Effective Teaching Learning at Primary Level: A Case Practice in Mathematics Teaching Learning in Nepalese School" concluded that teachers should match their work with level. Students have many ideas which they are well able to follow up the teachers' direction, combination of adequate settings, effective strategies and reliable tools of assessment of output, is an effective teaching learning process of mathematic, demonstrating an enjoyment of learning is communicated to the children in many areas of work and seeking new ways of stimulating and interesting them.

Sapkota, (2008), conduct a study on "Mathematics Teaching and Learning Practices at Effective School". Found that a single intervention in the learning cannot

give better result in achievement. Teachers and their teaching learning process were not only factors for high achievement in mathematics. Overall teaching and learning practices of the school contribute for the high performance in mathematics, included simulating physical facilities, school shared vision and goals, school policies interaction with staff, students and parent involvement, support for low performer, qualified teachers, assessment and monitoring systems, extra books for practice, emphasis on class work and homework, and extra classes for low performer etc. The quality of teaching and learning practice environment made a significant difference to mathematics teaching and learning environment as well as whole school's instructional environment.

Adewale (2010) states that one of the measure of school effectiveness that has stood the test of time is students' achievement. There seems to be a relationship between school effectiveness and school quality. The studies of Farombi, (1998); Onwualpa, (1998) and Fabayo (1999) deal with school quality. while school quality is looking at the level of material in puts allocated to school on a per pupil level and the level of efficiency with which fixed amount of material input are organized and managed to raise students achievement . School effectiveness is interested in such variable as: instructional leadership provided by the school head, curriculum learning objective, learning activities, and achievement measures. Other are monitoring of pupils and pupils attendance, discipline and school climate, expectations for quality work supported by staff and pupil, existence of school and community partnership programmed.

Khanal, (2012), studied on his research "Mathematics Classroom Environment of Effective School". Found that learning classroom environment is the most factor for promoting mathematics learning in the school. Only the single intervention in mathematics classroom environment cannot give students better toward their successful learning. Establishing teachers students relationship and cooperation, assignment and assessment system, applying classroom democracy equality, equity and justice, students centered strategies, motivation and use of teaching materials environment made a significant difference to the students achievement as well as whole academic achievement.

Research Gap

From the above literature review, it is shown that the research on effective school is growing day by day due to the insurance of quality education for saving the future of child in education in 21st century. There are many studies conducted in our context but it is still lack of study on influencing factors for school effectiveness.

Subedi (2005) conduct a study on mathematics learning management in an effective school taken by case practice, Neupane (2007) did study on effective teaching learning at primary level, Sapkota (2008) study only focus on mathematics teaching learning practices , lastly Khanal (2012) study faster mathematics classroom environment of effective school.

From above mention literature there is still gap of research in factors affecting effective mathematics teaching and learning, which is need to study in our context for the improvement of quality mathematics education. This study is conduct in Terai area in which such study is not conducted.

Theoretical Literature

A theory is primarily concerned with explanation and therefore focuses on determining cause effect relationships between the variables. A theory can be defined as attempt to develop a general explanation for some phenomenon. A theory describes the relationships among key variables for purposes of explaining a current state or predicting future occurrences.

Vygotsky Constructivism

This study is guided by the theory of Lev Vygotsky, the social constructivism. Social constructivism is most often associated with Vygotsky. According to the social constructivism, knowledge is best constructed when learners collaborate together. Students support each other and encourage new ways to form, construct and reflect on new materials. Lev refers to this as the "community of practice". Social interaction and participation of group member play a key role in developing knowledge. Vygotsky states "Every function in the child's cultural development appears twice, first, on the social level and later on the individual level, first between people and then

inside the child. This applies equally to voluntary, attention, to logical memory, and to the formulation of concepts. All the higher functions originate as actual relations between human individuals."

In terms of Vygotsky's quote, we interpret it to mean that we can learn more from each other than in isolation. Therefore, cooperation is essential for successful group learning. Culture and diversity of group members also play a key role and should be considered when groups are established. Learning is based on authentic situation and allows the group to reflect on ways the knowledge can be applied in everyday situations. Complex problem solving and students investigation provides opportunities for students to test their working knowledge. The group setting provides comfort for these students who have difficulty in learning from directed instruction.

The students' role in the social constructivism is multifaceted. The students must be active members of the group by being 'Social participation' (H. Marshall, cited in Acharya, B.R.2015). This means they must work collaboratively with peers to construct solid understanding of material. The students must think, explain and question each other within the group to make sense of the material as it relates to the real world.

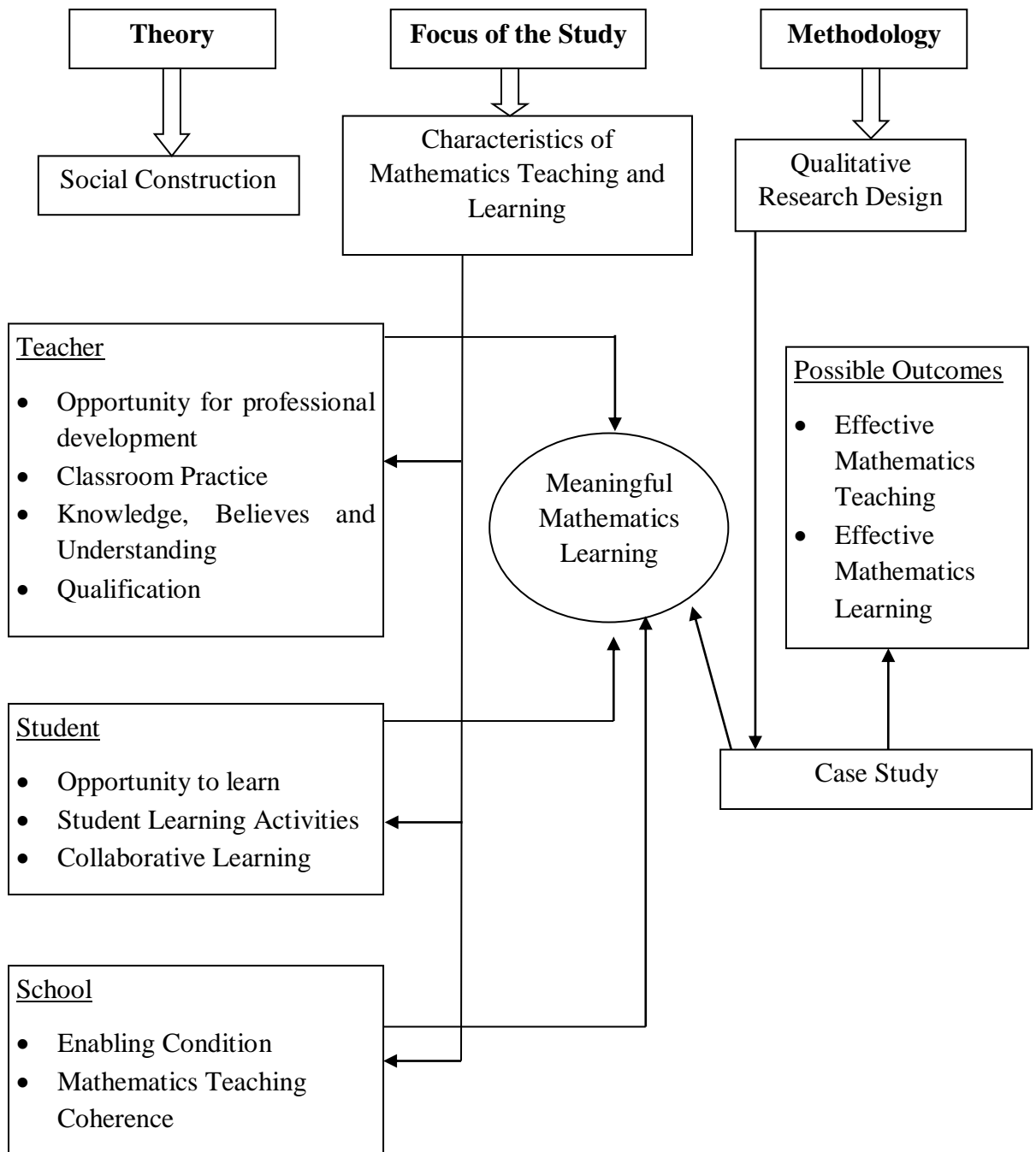
Teachers' have specific role. The teachers models the appropriate processes for his/her students and work with the cooperative group to guide learning. The teachers acts a facilitator or coach. He/ She scaffolds or provides building blocks for acquiring new knowledge. The teachers uses authentic assessments including group project, task analysis and peer evaluation to assess students understanding Zone of Proximal Development and instructional scaffolding guides the students throughout their writing process. The social constructivism has sound educational purposes. The primary focus is learning through socialization. Students move through the ZPD at their own pace by building on their own experiences and prior knowledge.

Vygotsky social constructivism is essential tool for collaborative teaching learning in which students and teachers both are actively engage in teaching learning procedure. Which is most important part of effective mathematics teaching and learning.

Conceptual framework of the Study

A conceptual framework is a representation, either graphically or in narrative form, of the main concepts or variable and their presumed relationship with each other. This study was conducted on effective mathematics teaching and learning. In this study as a researcher was view three factors teachers, students and school responsible for effective mathematics teaching and learning. In teachers factors are opportunity for professional development, classroom practice, knowledge, believes and understanding and qualification; in students factors involves here are opportunity to learn, good achievement and collaborative learning and school factors are enabling condition, context and mathematics teaching coherence. This study is frame by social constructivism. This research was done by using qualitative research design called case study method. The implication of this study was future research of effective mathematics teaching and learning .Conceptual framework of this study is given by following figures:

Conceptual Framework of the study



(Source: Bishop, et.al, 2004)

CHAPTER: III

METHODS AND PROCEDURES

This chapter describes how the study is conducted to fulfill the mentioned objectives. Inside this chapter it describes the design of the study, respondents, data collection tools, method of data collections tools analysis and interpretation. This study was based on case study method which is qualitative and explorative, which tried to explore implementation of the characteristics of effective mathematics teaching and learning.

Research Design

A research design is the logical and systematic planning and directing of a piece of research. The design results from translating a general scientific model into varied research procedures. The design has to be general to the available time, energy, and money; to the availability of data; to the extent to which it is designable or possible in impose upon persons and social organizations which might supply the data Sharma (2011). This study was based on the case study research approach.

Qualitative research is a situated activity that locates the observer in the world. It consist of a step of interpretive material practices that make the world. They Hum the world into a series of representations, including field notes, interviews, conversations, photographs, recording, and memos to the self. At this level, qualitative research involves an in interpretive, naturalistic approach to the world. This means that qualitative researcher study things in their natural setting, attempting to make sense of, or interpret, and phenomena in terms of the meaning people bring to them.(Denzin and Lincoln, 2005).

Case study

A case study is a method for learning about a complex instance, based on a comprehensive understanding of that instance obtained by extensive description and analysis of that instance taken as a whole and in its context (Sharma, 2011). According to Young, (2006), a case study is use in comprehensive study of a social unit- which may be unit person, a group, a social institution, a district or a

community. In this study mathematics classroom practice effective school was taken to be a case. Where the researcher observed factors that are responsible for effective mathematics teachers, students and school characteristics in effective mathematics classroom.

Study Site

The school was chosen on the basis of effective teaching learning. Effectiveness here is measured through three components. The first component is teachers which includes qualified professional staff, teachers' qualification, knowledge, experience. The second factor is students which includes opportunity to learn, students learning activities and collaborative learning. Finally the third factor component is school which includes physical environment, enabling condition. According to the purpose of the study and above reviewed literature, the researcher was selected Sankat Mochan Devsharan Ramrati Higher Secondary School, Janakpur-4 among many other better effective schools.

Sample of the Study

Only one effective school of secondary level was to be chosen by researcher convenience. The criteria of effective school was to be the school where managing physical environment, long period experience to schooling, qualified professional staff, more talent of students performance, high level students' achievement, achieving their better result in SLC. The four mathematics teachers and ten students are chosen for interview. Students are taken from class X.

Sampling

For the sample of this study mathematics teachers and students were selected by purposive sampling method. Adopting this procedure, four secondary level mathematics teachers and ten students of class ten of effective school of Dhanusha district was selected as sample. Thus, sample size of this study was fourteen.

Data Collection approach:

The data was to be collected through primary sources by the method of classroom observation, interview, and school documents.

Classroom Observation

Observation is a kind of tool which helps to seek knowledge through the use sense, i.e. eyes, ears, nose, tongue and skin. It has great importance not only in research work but also in our daily lives. The observation form was formulated for observing factor responsible for effective mathematics teaching learning, teaching practice of mathematics teachers and students learning characteristics by the help of modifying the effective teaching learning at primary level classroom observation form by Neupane, (2007). In the study site the researcher observe the ten classes of mathematics teachers on the basis of observation form which is kept on appendix-D.

Interview

Interview is another effective tool to collect the required information from the respondents. It shows that the true fact of research objectives. Exploratory interviews was used to gathered participants' understanding and experiences about the teachers, students' and school factors for effective mathematics teaching and learning. It is flexible tool for data collection, enabling multi-sensory channel to be used; verbal, non-verbal, spoken and heard. The interviews used semi structured questions but include an exploratory form as the researcher was explore the responses asking new questions in order to clarify and extend to investigation. The interview was taken from the Head teachers, Mathematics teachers and selected students with semi structured questionnaire. The interview questionnaire develop on the basis of exiting literature and fact finding on the basis of conceptual framework. The semi structured interview questionnaire was developed for explore the head teachers, mathematics teachers and students on three main category called teachers factors, students factors, and schools factors which was kept in the appendix- A, appendix- B, appendix- C, for head teachers, teachers and students respectively.

School Document

School document was used aiming to collect different information about the school such as past result, physical facilities, resources, students' records.

Method of Data Collection

This study was conducted by using qualitative research called case study method. The researcher was collect both primary as well as secondary data. The primary data was collected by classroom observation of class ten during three weeks classroom observation the students and teachers characteristics was observe, and taking the semi structured interview with ten students which was selected with researcher convenience, taking the interview with school principal and mathematics teachers about effective mathematics teaching learning factors. The secondary data was collected through analyzing school documents and other magazines published from school to fulfill the research objective.

Procedure of Data Analysis

The collected information was first categorized according to the category of the respondents and then different theme were given in the text of the interview and of the observation note. These themes was considered as a code. The similar code version of the respondents was collected together and explained in their perspectives and Obtain data was analyze through qualitative procedure. Such as triangulation, theme induction. The obtained qualitative data through interview was analyzed in agreeing with Crasswell (2009), "preparing the data, connecting the variables, and drawing deeper understanding while presenting and interpretation of the larger meaning". The collected audio/video data was transcribed all in to text and those were processed and analyzed in accordance with the outline laid down by objective of the study to generate the themes. The inducted themes were used for interpretation.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF DATA

This Chapter deals with the analysis and interpretation of the collected information from case school during the study. The researcher observed the class with the help of observation form directly which was done carefully in the classroom. Classroom activities were noted by different outlook of setting at Grade X, with the help of un-structural interview schedule, the interview was taken with focused children, Mathematics teachers and Head teachers. The interaction with the respondents were carefully listed and noted properly. The focused children's attendance, regularity and other necessary records. Classroom environment and details about school were obtained by researcher himself and interviewing to Head teachers as well as document of the school.

The methods used in this study were basically interpretive because this study analyzed and described the characteristics of effective mathematics classroom. The teaching and learning environment for characteristics of effective mathematics classroom of effective school was discussed and analyzed in three categories which are teachers, students and school characteristics. Under the teachers characteristics the researcher collected the information about opportunity for professional development, classroom practice, knowledge, believes and understanding and qualification. Under the students characteristics the researcher collected the information about opportunity to learn, good achievement, collaborative learning. Under the school characteristics, the researcher collected the information about enabling condition, context, and mathematics teaching coherence. Collected information were analyzed and discussed under the following heading.

Introduction of Case

The researcher was taken an effective mathematics teaching school as a case, the criteria for selecting effective school is S.LC result of academic year 2072 BS, public opinion and students' number. The researcher selected these two schools of Dhanusha district which is located on urban area that is in Jankpur. The school was selected purposively. The first school is Shree Sankat Mochan Devsharan Ramrati Higher Secondary is a reputed Public school. In this section, the researcher has analyzed and interpreted about physical facilities of the school and classroom, SLC result of past five years, current data of class wise and level wise distribution of

students, teachers' demography and reform of school. The researcher has also tried to relate this information to the classroom.

Sankat Mochan School had been established in 2029 (1972 AD) as a Primary school with the enthusiasm of local youth Goyanka phulbari Educationist .The school lunched the secondary level education in the year 2042 B.S. with its new Head teachers Raj Narayan Mishra, he worked there for 13 years. During his period. He tried his best to reform the schools' physical and academic environment. The school has attempted first SLC exam in 2047 B.S. Meanwhile, the chairman of school management committee (SMC) Bajrang Prasad Sah has great contribution. The contribution of past (SMC) chairman Jagarnath Shah and Bishawa Nath Shah had great importance with the help of late Ragho shing. Different organizations and social activities for physical and financial contribution had major role for the physical development of the school.

This school has continuously been serving in the field of quality education. It is feeling of many doctors, engineers, artists, politicians, teachers, businessmen and administrators who received their school education from there. It is a public school and targeted to produce quality manpower for the country. The parents' views towards this school was positive. They were confident with their children's success in SLC results.

The management committee of the school seems stronger. In the management committee the school has assembled senior human right activist, educationist, politician and social workers. The management committee meeting and PTA is organized monthly. Important issues and problems about school are discussed. The chairperson of the management committee visits frequently to this school.

Physical Facilities and Environment

The school is located in the area of 14 Katha 2 Dhur. There are 4 RCC building. Altogether, there are 35 rooms in the school in which 26 are teaching rooms. The rooms are middle in size, well ventilated room. The playground is not enough to play different games. The ground of the school is also plastered. There is facility of pure drinking water. The facility of toilet is good. The Details physical facilities of the school are as follows:

Table 4.1
Table of Physical Facilities of the School

Area of the School	14 Katha 2 dhur
No. of building	4
No. of Rooms	35
No. of teaching rooms	19
Head teachers room	1
Office	2
Resource center	1
Size of Room	25x26 sq. fit.
Library	1
Lab room	3
Administration Room	2
Account Room	1
Computer Room	1
Temple	1
Telephone	3
Play ground	1
Main gate	sufficient
Tap for drinking water	5
Toilet, (boys, girls, staffs)	29
Furniture and Materials	
Comfortable table	6
Steel table	1
Revolving chair	1
Wooden chair	8
No. of Desk and Benched	132 than new & old in which 14 desk Bench
No. of racks	12
Arm chair	38
Teaching materials	sufficient
No. of white board	30 than / 4 white board
Microscope	3
No. of gloves	2
Flannel board/Geometry box, Graph board	8/ 3/2
Telescope	1
Posters and bulletins	2
Fan	65
Medals and shields	sufficient
Play instrument	yes

Current Data of the Students

There were 1875 students' in school. Among them about 49.07 percent that is 920 students were girls and the remaining were boys. There are altogether 46 teachers and the students' and teachers ratio of school was 1:30 which is the exact government criteria according to education Act, 2028.

Table 4.2
Class wise and Level wise Distribution of Students

Level	Class	Students		Total
		Boys	Girls	
Pre-Primary	Nursery	14	17	31
Total		14	17	31
Primary	I	26	25	51
	II	32	21	53
	III	53	38	91
	IV	32	24	56
	V	65	60	125(Two sections)
Total		208	168	376
Lower Secondary	VI	67	81	148
	VII	86	124	210
	VIII	128	145	273
Total		281	350	667
Secondary	IX	287	279	566
	X	127	124	251
Total		414	403	817
Grand Total		920	935	1875

(Source: School's Record, 2073)

Educational Achievement of the School

Sankat Mochan Devsharan Ramrati School is a public school. In its long history of secondary status, it has gained glorious success. From the record of the school, collected information about the school achievement in SLC is given below:

SLC Result status of the Case Study

The school had appeared in the SLC since 2047 B.S. It has best SLC result and has awarded by the government in different year as the best school among the government school.

Table 4.3
SLC Result of Last Eight Year

Year	Total Examinees	Passed Division				Total Pass Percent
		Distinction	first Division	Second Division	Third Division	
2065	236	2	38	100	30	72.03
2066	234	5	70	80	50	87.60
2067	202	2	67	50	60	88.12
2068	208	1	40	95	45	87.01
2069	171	1	35	70	20	73.68
2070	189	2	45	102	-	78.83
2071	208	1	30	56	56	68.75
2072	235	7	100	103	-	89.36

The table 4.2 shows that the school has not a bitter experience where students passed in third division from last 8 years in SLC exam. The table further shows that the trend of success is very high in the proportion in comparison to the available physical facility. The rate of distinction and first division has been increased. The SLC result from 2065 to 2072 was progressing. The number of girl's students appearing in SLC and their success rate cannot be differentiated by gender, which shows that the quality of students' has been increasing every year.

"We are always sincere about our students' achievement. We create learning opportunities according to students level and take extra classes in the school" - Math's teachers version.

"This year passed percentage of students in the SLC is satisfactory because we had provided extra classes for the students and teachers were more responsible in their respective subject". -Head teacher.

"This year most of the students are passed in SLC with Distinction so we hope we all was passed in SLC exam with distinction."-Students.

From the above narration it is found that the teachers and learning opportunities in school always focused on the students' achievement i.e. the goal oriented environment. There were no biasness to students' in terms of roles, responsibilities and opportunities to involve in learning.

Demography of Teaching and Non-Teaching Staffs in the School

Teachers' number, qualification, training and experience are the important factor for better classroom learning in the school. Teachers are important input including others inputs such as physical facilities, educational material and extra facilities given to the teachers for the development of effective classroom. The total number of staffs of school is 46 among them 41 are teachers. The ratio of the teachers and students is about 1:30 which shows that the teachers are sufficient for teaching according to the number of students' (See Appendix- D). According to school observation, file and records of the case school, there are experienced teachers in school. Many of them have passed their Bachelor Degree in Education (B.Ed.) and some of them have done master degree in education (M.Ed.).

Table 4.4

The Level Wise Distribution of Teaching and Non-Teaching Staff

Level	Male	Female	Total
Pre-Primary and primary	6	16	22
Lower secondary	4	3	7
Secondary	6	4	10
Staff	4	3	7
Grand Total	20	26	46

(Source: School's Record, 2073)

The major element of school for improvement is teachers' quality and adequacy. The present status of this school shows that there was adequate number of experienced and qualified teachers. Head teachers in this school are qualified and

excellent in leadership. He had participated in so many educational seminars and training organized in national and international level. There are three senior Math teachers for secondary level.

"For the professional development of teachers, school provide salary in time, send teachers to participate in training, provide text books, practice books, teachers guide and necessary extra materials, provide extra salary for teachers" and to encourage as well.- Head Teachers

From the above discussion, it can be said that all teachers and Head teachers were well experienced. Head Teachers was always sincere and active regarding the management of school so this school is taken as a case.

Interpretation of Data.

Firstly the collected information was categorized according to the category of the respondents and then different themes were given in the text of the interview and of the observation note. These themes were considered as a code. The similar code version of the respondents was collected together and explained in their perspectives and obtain data was analyzed through qualitative procedure. Such as triangulation, theme induction. The themes are present below:

Teachers Characteristics

In posing the rhetorical question. What matters for teachers effectiveness? Darling-Hammond and Ball (1998) answered that what matters is “Teachers knowledge of subject matter, students learning and development, and teaching methods”. The characteristics of effective teachers that are considered here are those that are amenable to change and which have an impact. For this reason, the focus in the following sections is on initial teachers education and teachers learning through professional development. It is stated that

1. Students’ performance was higher when their teachers had majored or minored in the subject they were teaching;
2. Students performed at a higher level if their teachers received professional development in working with different students populations; and

3. Students whose teachers had received professional development in higher-order thinking skills outperform students whose teachers had not.

Opportunity for Professional Development

It is found that pre-service teachers education typically has a weak effect on teachers' knowledge and beliefs. The authors point out that this may be due to the many hours of observations of other teachers made by many prospective teachers. It argue that this both instils traditional images of teaching and learning and shapes understanding of mathematics.

From interview teachers one and teachers third said that, "*Excellent teachers of mathematics have a sound, coherent knowledge of the mathematics appropriate to the students level they teach, and which is situated in their knowledge and understanding of the broader mathematics curriculum. They understand how mathematics is represented and communicated, and why mathematics is taught. They are confident and competent users of mathematics who understand connections within mathematics, between mathematics and other subject areas, and how mathematics is related to society*".

From the above interview the researcher argue that professionals development help in effective teaching and learning of students. It lead effective way to teaching learning of mathematics by which students got more skills of problems solving and mathematical calculation.

From the school observation, it was found that: *teachers of mathematics in effective school had rich knowledge of how students learn mathematics. They have an understanding of current theories relevant to the learning of mathematics. They have knowledge of the mathematical development of students including learning sequences, appropriate representations, models and language. They are aware of a range of effective strategies and techniques for: teaching and learning mathematics; promoting enjoyment of learning and positive attitudes to mathematics; utilizing information and communication technologies; encouraging and enabling parental involvement; and for being an effective role model for students and the community in the ways they deal with mathematics.*

From the classroom observation researcher found that effective school used the modern approach of pedagogy to teach mathematics. The teachers of mathematics know the skills of teaching and learning.

From the literature review it was found that in some education systems, standards for teachers have been established to promote professional growth in education. These standards can also help to identify factors associated with effective teaching. The Ontario College of Teachers is the self-regulatory body for the teaching profession in Ontario (The Professional Affairs Department, 1999). In 1999, it produced *Standards of Practice for the Teaching Profession*. The goal of this document was to answer the question, *what does it mean to be a teachers?* The Ontario College of Teachers answer was that it expected a teacher to demonstrate: (a) care for and commitment to students; (b) equity and respect in their treatment of students; and (c) encouragement of students' individuality and their contributions to society. In order to demonstrate professional knowledge, the College asserted that teachers must know the curriculum, the students, the subject matter, teaching practice, and education-related legislation. Professional knowledge of these factors, it was argued, would allow Ontario teachers to promote students learning and to be educational leaders who would collaborate with their colleagues and other professionals, parents, and the wider community.

In the interview Mathematics teachers of selected school, teachers four and two said that, *"The professional development of teachers consists of (a) students achievement; (b) subject knowledge; (c) planning; (d) teaching, managing pupils and maintaining discipline; (e) assessment; and (f) advising and supporting other teachers. Teachers are assessed through a portfolio, classroom observation, an interview, consultation with the teachers principal, and references from colleagues. Under this model, excellent teachers must be up-to-date in their specialization, fully understand the connections within their subject, and understand information communication technology (ICT). Evidence of their ability to plan is demonstrated by lesson plans that are assessed as having clear objectives and high expectations of the students. They are required to plan their teaching to build on students' current and previous work. The ability to teach is judged on the extent of flair, creativity, enthusiasm and challenge the teachers presents in class. In addition, the teachers is*

expected to use questioning and explanation skillfully, develop literacy, numeracy and ICT skills as appropriate, and be able to support students in need of additional assistance. They are also expected to maintain respect and discipline and be consistent and fair. Effective teachers are required to use assessment diagnostically, as an aid to planning, and to improve their teaching. They are expected to support and coach other teachers, to have highly developed interpersonal skills, be a role model for other staff in their personal and professional conduct, be effective managers of time, and be highly respected and able to motivate others. It is claimed that the students of excellent teachers demonstrate high outcomes in relation to prior attainment, are highly motivated and enthusiastic, exhibit high standards of discipline and behavior, and, finally, have this reflected in a consistent record of parental involvement and satisfaction.

From the analysis of interview data analyzed above the researcher concluded that excellent teachers which use standards-based performance assessments. All of the Standards emphasize that accomplished teachers should be aware of what they are doing as they teach and why they are doing it. They are expected to be conscious of where they want students learning to go and how they want to help students get there. Furthermore, they must monitor progress towards these goals continuously and adjust their strategies and plans in light of feedback. Accomplished teachers are expected to set high and appropriate goals for students learning, connect worthwhile learning experiences to those goals, and articulate the connections between these goals and experiences. They must be able to analyze classroom interactions, students work products, and their own actions and plans in order to reflect on their practice and continually renew and reconstruct their goals and strategies.

In the summary of this theme the school and classroom observation and also from interview it was found that effective school mathematics teachers had an opportunity of professional growth in their subject matter. Profession development leads mathematics teachers to effective teaching and learning procedure. Effective teachers had a positive effect on a range of student's outcomes; teacher's practices in the classroom directly affect student's outcomes; teacher's practices in the classroom are directly affected by the capacity of the teachers, the quality and field(s) of their training and qualifications; and teacher's capacity is directly affected amplified or

muted by conditions within the school. In particular, the school's professional community was theorized to be of prime importance.

Teachers' beliefs

Teachers' belief-systems appear to have important effects on students' outcomes; it means beliefs about teaching and mathematics held by teachers. This study of effective teachers found that they had the key beliefs related to mathematics teaching and learning. Teachers in the study were interviewed about their educational orientations to teaching, mathematics and styles of interaction with students.

The results of these interviews suggested that *there were three types of orientation that teachers adopted in the teaching of mathematics: Connection, Transmission, and Discovery. All but one of the highly effective teachers were classified as 'connectionist'. That is, these effective teachers saw mathematics as richly connected and adopted classroom strategies which help students to make links. Teachers holding other orientations were all classified as being only moderately effective.* These findings have been supported by Ma (1999) who used the concept of 'connectedness' – together with three other properties of understanding, 'basic ideas', 'multiple representations' and 'longitudinal coherence' – to describe the teaching focus of teachers who have a 'profound understanding of fundamental mathematics'.

Teachers' beliefs, practices and attitudes are important for understanding and improving educational processes. They are closely linked to teachers' strategies for coping with challenges in their daily professional life and to their general well-being, and they shape students' learning environment and influence students motivation and achievement. Furthermore they can be expected to mediate the effects of job-related policies – such as changes in curricula for teachers' initial education or professional development – on students learning.

From classroom observation teachers' beliefs, practices and attitudes and shows that in all participating in sample school certain beliefs and practices are more prominent than others. It also highlights cross-cultural differences regarding beliefs and practices, the quality of the learning environment, the strength of teachers' beliefs in their own efficacy, and their job satisfaction. The second part of the chapter focuses

on the relations between teachers' views of learning and instruction and the school as their place of work. Some findings are remarkably consistent in the school are given below.

From the school and classroom observations following beliefs were found:

- Effective/good teachers demonstrate the correct way to solve a problem.
- Instruction should be built around problems with clear, correct answers, and around ideas that most students can grasp quickly.
- How much students learn depends on how much background knowledge they have; that is why teaching facts is so necessary.
- A quiet classroom is generally needed for effective learning.
- My role as a teacher is to facilitate students' own inquiry.
- Students learn best by finding solutions to problems on their own.
- Students should be allowed to think of solutions to practical problems themselves before the teachers show them how they are solved.
- Thinking and reasoning processes are more important than specific curriculum content.
- Perceived mathematical ability;
- Perceived task load involved in the study of mathematics;
- Perceived environment;
- Perceived utility of mathematics to the students;
- Reported mathematical self-efficacy of the students;
- Reported enjoyment of mathematics by the students; and
- Reported level of motivation for the study of mathematics by the students.

From the above finding researcher concluded that the teachers believe play crucial role to teach the mathematics effectively in the classroom. There are three type of teachers believe in mathematics namely connectionist, transmission, and discovery. These three types play important role to prompt the mathematical achievement.

Teachers Qualification

The qualification of teachers to be effective is associated with four key facets: (a) their expertise; (b) their conception of what it means to be a teacher and a teacher of mathematics; (c) their beliefs about teaching; and (d) their teaching experience.

Berliner et al. (1988) reviewed the study of expert teachers and identified some common characteristics (and how they differed from novices). These characteristics were:

- Experts often made inferences about objects and events while novices usually held more ‘literal views’.
- Experts often classified problems to be solved at a relatively high conceptual level while novices usually classified problems using ‘surface’ characteristics.
- Experts tended to have faster and more accurate ‘pattern recognition capabilities’ compared to novices.
- Experts seemed to take longer to examine the problem and to build a problem representation.
- Experts built different ‘problem representations’ compared with novices.
- Experts showed greater self-regulatory capabilities than novices.
- Expertise was built up slowly, and with much practice.

In our study of expert teachers in mathematics flesh out some of the characteristics identified effective teachers of numeracy found that the effective teachers had “coherent beliefs and understandings” and that these “underpinned their teaching of numeracy”. Effective teachers thought that discussion of concepts and images was important in exemplifying the teachers network of knowledge and skills, and in revealing pupils' thinking, and that it was the teachers responsibility to intervene to assist the pupil to become more efficient in the use of calculating strategies. It was found that teachers who gave priority to pupils acquiring a collection

of standard arithmetical methods, over establishing understanding and connection, produced lower numeracy gains. The previous study suggest that the teachers qualification led positive role in students mathematics achievement. In a similar vein, also, it was found that expert teachers draw on a richer and deeper knowledge structure than novice teachers. Novices had less well developed ‘schemata’, due, probably, to having had less experience.

The teachers' qualification of study school was here thoroughly described. The researcher interview the four teachers. The qualification of all four teachers passed master level in mathematics. Out of four teachers, three teachers from education faculty and one from the arts faculty. Due to the master degree qualification the teaching qualification they all teach well order manner and effective way.

The interview data reported that all four teachers said *expert teachers had ‘scripts for change’ stored mentally, and these could be quickly accessed and implemented. Planning was identified the key dimensions underlying the expertise of experienced teachers. They also saw expert teachers as knowledgeable, able to adapt to practical constraints, and able to perform their teaching tasks rapidly with little or no cognitive effort. It emphasis on the problem solving orientation of the experienced teachers noting that: the more teachers knew about their pupils’ mathematical knowledge, the better the pupils were at word problem-solving.*

It can be concluded that from above data Knowledgeable teachers questioned their pupils about problem-solving processes and listened to their responses, while less knowledgeable teachers tended to explain problem solving processes to pupils or just observe their pupils’ solutions the five stages in teachers development: (a) novice; (b) advanced beginner; (c) competent; (d) proficient; and (e) expert. “We might expect experienced/expert teachers of mathematics to be more likely than novices or postulants (i.e. students teachers) to focus on events that have instructional significance; to ‘read’ the patterns of classrooms quicker and more accurately; to agree among themselves about what is and is not going on; to be more work orientated in their views of classes; and to make more assumptions and hypotheses about classroom phenomena”.

Students Characteristics

The opportunity to learn mathematics effectively is dependent upon a wide range of factors, but among the most important are those which are related to activities and practices within the classroom. This is reflected in the focus of a number of important studies. For example, the Effective Teachers of Numeracy Study focused strongly on the classroom and what happens there. Similarly, the Third International Mathematics and Science Study focused on the classroom.

Within the classroom, it is possible to discern a number of key elements. These include: (a) teaching practices; (b) the nature of students learning activities; (c) the amount and nature of engaged learning time experienced by students; (d) the learning environment; and (e) the scope and nature of the feedback given to students. Teaching practices are central to understanding what makes for effective teaching. The effective teaching practices included:

- a focus on meaning and understanding mathematics and on the learning task;
- encouragement of students autonomy, independence, self-direction and persistence in learning; and
- Teaching of higher-level cognitive processes and strategies.

Successful teaching strategies as requiring an organized approach to teaching, where material was taught until it was mastered. It argued that in classroom instruction three modes exist: (a) giving information; (b) soliciting information; and (c) providing feedback. In providing information, for example, an effective teachers requires an approach which structures the information so that the lesson forms a coherent whole; one which relates previous work to new material. To do this well requires clarity of presentation and good sequencing of information. Students actions within and their reactions to what occurs in the classroom have also been identified as important determinants of teachers practice.

Students Opportunity to Learn

The opportunity to learn mathematics effectively is dependent upon a wide range of factors, but among the most important are those which are related to

activities and practices within the classroom. This is reflected in the focus of a number of important studies. For example, the *Effective Teachers of Numeracy Study* focused strongly on the classroom and what happens there. Similarly, the *Third International Mathematics and Science Study* focused on the classroom practice.

During the classroom observation the researcher found that in effective school the students get more opportunity to learn by their friends and teachers. Students learning opportunity provides confined to the students for solving mathematical problems and hence increased the mathematical achievement.

Students Learning Activities

Frameworks for effective teaching to support students' conceptual understanding need to emphasize the need for tasks that are mathematically challenging and significant. The conceptual difficulty of the task and the teachers use of this difficulty in 'pressing' the children to think, study suggest that results in activities where the mathematics drives the teaching and learning to the extent that, higher students achievement and conceptual understanding results. In general, insufficient attention is being paid to "the critical role of conceptually focused, robust tasks that can be used to support the development of sophisticated mathematical thinking".

The classroom observation result suggests that the mathematical activity was more in classroom of effective school. *The researcher found that the students of observed school were engaged in many more task for solving the mathematics. In leisure time the students are solve the mathematical problems in class. Similarly interview to the head teachers said that in our school the students are eager to do the task in mathematics. Even in leisure period students are solved the mathematical problems and other curricular activity. The students were fully concern academic activity and ware about their learning achievement.*

The above consequences conclude that the students learning activities is essential students' factor for effective mathematics teaching. Learning activity of students in mathematics determined their achievement in further success for shaping the future in mathematics. Students' engagement, both its depth and extent, has come

under scrutiny as a factor affecting students' achievement. Engagement is probably related to classroom environment. A mathematician argues that the classroom environment needs to be supportive of learning, and this entails engaging students.

Collaborative Learning

Collaborative learning cannot be used through verbal instruction. Students can adopt collaborative learning through a process that involves working together in groups, developing a product at the end and examining both the product and collaborative learning skills. Collaborative learning method emerges in the literature as a method that assists instructors in carrying out this process. Collaborative learning emerges when students gather in order to reach a common goal. Each member of the group reaches his goal only if all the other members reach their own learning goals. Collaborative learning as working of students in small groups and helping each other in the learning process.

From the school visit the researcher found and observed the following features of effective mathematics classroom under collaborative learning. These are:

- **Positive Interdependence:** Each individual depends on the other members of the group. Each individual complements others.
- **Individual Accountability:** Individual accountability is the evaluation of each individual's performance and effect of the result on individual and group success.
- **Face to face interaction:** Group members reach success by helping each other and sharing ideas. As face to face interaction increases in this process, the sense of responsibility and social solidarity increases.
- **Social Skills:** As the students are in a group in the collaborative learning, they acquire social skills better.
- **Evaluation of the Group Processing:** At the end of the group work, students gather and discuss the productivity of the project and whether they have reached the goals.

From the school practices the researcher found that this method had a favorable effect on making the relevant gains. The cooperation based learning-teaching environment of the study provided cooperative learning environment,

supported permanent learning, provided opportunities to be successful, contributed to the development of social and personal skills, but caused students to worry as it requires students to be successful at all stages.

School Factors

Students learning is, typically, affected most directly by the quality of opportunities for learning that individual teachers can provide. However, the quality of teaching is in turn affected by a wide variety of conditions at the school level. Workplace conditions can exert a powerful influence over the quality of teaching in two main ways: (a) when they help to attract and retain quality people into the profession; and (b) when they energize teachers and reward their accomplishments.

Schools differ in their capacity to ensure that all mathematics teachers are well qualified in mathematics and with specific training in the teaching of mathematics. Newman identifies four dimensions of school capacity: (a) leadership; (b) professional community; (c) program coherence; and (d) teaching resources. Which aspects of school organization matter most to effective teaching? There is a long tradition of research, for example, examining the relationship between the organizational context of schools and the quality of teaching and students learning. It is suggested that the relationships between school 'restructuring' and students learning were weak, except where organizational resources (time, leadership, collaboration, administrative support, knowledge and skills) were deployed in ways that promote professional interaction and development. Teaching is the most important factor in effectiveness, and that while school structures can provide opportunities, these structures, of themselves, do not directly contribute to this teaching.

School Enabling Condition

The enabling conditions provided by the school were seen to be described by four factors: (a) leadership at both the school and mathematics department level; (b) the quality of the professional learning community in the school; (c) program coherence within the school; and (d) the quality and quantity of teaching resources in the school.

Leadership at the school was seen as directly influencing the quality of the professional community in the school. It was theorized that there would be a reciprocal relationship between the quality of the professional community in the school and the coherence of the school's program.

While the researcher observes the classroom of the teachers it was found that there is a strong combination between school administration and mathematics teachers. The mathematics teachers get full help from school administration. The stronger the professional community, coherence in the school's program was observed. These relations can be seen from Leadership to Professional community, and the reciprocal arrow from Professional community to Program coherence. The resources needed for teaching were seen as having their major effects on students' opportunity to learn.

From the above paragraph, it is concluded that professional development involvement was seen to influence the professional learning community at the school and its program coherence. That is, the more involvement there was in professional development, the more likely that there would be a professional learning community in the school, and that its program would be coherent. Professional community was also seen to be influenced by the qualifications and the initial training of the teachers. School system factors were seen to influence the coherence of the school program, and the technical resources available in the school.

Mathematics Teaching Coherence

Program coherence is a measure of integration of the different elements in the school as an organization. In effective school the concept of 'program coherence' as a dimension of school capacity. They defined program coherence as "the extent to which the school's programs for students and staff learning are coordinated, focused on clear learning goals, and sustained over a period of time". One indicator of program coherence, for example, is the extent to which teachers professional development is linked to attaining the school's goals for improved students learning outcomes. In my observation the mathematics teachers of that school were presents the lesson sequence in correct order and good classroom management.

In the interview with teachers and students the researcher reported that *“classroom climate is significant factor in students' achievement. Classroom climate is seen as a businesslike environment that is nevertheless relaxed and supportive of pupils, with high teachers' expectations. The identification of demographic features of schools is critical to understanding what factors affect variation in teachers' effectiveness. These factors may include the language background of the students, the socio-economic status of the school catchment area, the proportion of Indigenous students, and the geographic location of the school.*

Form the above data analysis the researcher argued that programs coherence is important factor from which school and students both can progress in mathematical achievement. Program coherence demands the sequential link between school program, lesson, and activity of students from which own can get more knowledge.

CHAPTER V

FINDINGS, CONCLUSIONS AND IMPLICATIONS

This study is a case study of an effective school. The objectives of this study is to identify the characteristics of mathematics teachers in the effective mathematics teaching learning, identify the students characteristics of effective mathematics classroom and to explore the school teachers in the effective mathematics teaching learning. This case study attempt to describe the characteristics of students and teachers towards better and successful learning. The researcher reviewed literatures from library study, internet visit, thesis, dissertations, book journals and other related literatures. By the literature review, the researcher developed a framework with characteristics learning and key factors as teachers, students and school of effective school. The study is formed in above key factors. The major tools used for this study were class observation form, semi- structure interview schedule, and school document. The respondent of the study were students, mathematics teachers, and Head-teachers.

Finding of the Study

This study is related to the characteristics of effective mathematics teaching learning of secondary level. Which was observe through the case study of well managed school of Dhunusha district. Which is lies central part of Jankpur. From the observation result the researcher divided the finding into the three categories. Which are teachers' factor, students' factor and school factor.

The researcher found that the first factor that affect the effective mathematics teaching and learning is teachers factor. By various linking and analyzing the collecting data showed that teachers professional development is important factor for meaningful math teaching, teachers' classroom practice, teachers belief about the students and subject matter lead positive characteristics towards mathematics teaching. Finally, teachers qualification and subject matter knowledge is essential factor for effective math teaching.

Secondly the researcher found that students' factor is also important factor in effective mathematics teaching learning. Under the students factor students'

opportunity to learn is important. It is found that ineffective school students had got more opportunity in learning process, similarly students learning activity of students in mathematics is key element of mathematics classroom, in an effective mathematics classroom students showed collaborative learning environment.

In an effective school, school factor is equally important for mathematics learning. Overall school environment and classroom environment play important role in effective classroom conduction. Among the school factor school enabling condition is first factor for effective learning. The managerial aspect of school shows the school enabling condition. Mathematics teaching coherence was also found as characteristics of effective mathematics teaching. From this case study of mathematics teaching in the effective should the following are the major findings.

- It is found that the effective mathematics teaching and learning is affected by teachers' factor under this teachers professional development, teachers belief and teachers qualification is main sub factors.
- Teachers professional development leads to increase the mathematics achievement of students and meaning teaching.
- Teachers' belief about the students and subject matter lead to meaningful mathematics teaching.
- In effective school the qualification is higher than other school.
- The second factor for effective mathematics teaching learning schools is students factor, under this factor three sub factors was found in effective school namely opportunity to learn, students learning activities and collaborative learning.
- In effective school the students get more opportunity to learn by their friends and teachers.
- Effective school had vision of students learning activities which is important for teachers.
- In effective mathematics classroom the students shred the learning activities to their friends so, the students collaborative learning was take place.

- The third factor for effective mathematics teaching and learning was school factors, in this factor two sub factors called school enabling condition and mathematics teaching coherence.
- By school enabling condition, school learn leadership in teaching and administration part so, it increase the students achievement.
- Mathematics teaching coherence has a part of effective mathematics teaching learning through which students' progress in mathematics.

Conclusions

Based on the above major findings the following conclusion can be drawn. The teachers' factor is more responsible for effective math teaching so it is most important to select a qualified teacher. Teachers qualification, professional knowledge, subject knowledge, training are important while appointing the teachers. Secondly students also need to show collaborative learning environment which promote their learning achievement and their success in academic field. It also need to provide good opportunity to learn for the students. Which created effective learning situation in the classroom. school environment needs to be more stimulating for mathematics learning with adequate building and compound surrounded by walls having sufficient classroom as well as sufficient desks and benches for mathematics and opportunity for them participate in the mathematics training, for the professional development of mathematics teachers.

School characteristic's also play a key role in effective mathematics teaching and learning. In this characteristics enabling condition, school environment, and mathematics teaching coherence are the major characteristics. The Head-teachers of the school is also a qualified and experienced mathematics teachers has supervised mathematics class once a month as well as encouraged to the mathematics teachers and students work. School has developed a mathematics committee in which issue and problem of mathematics are discussed and shared their idea of mathematics teaching

Implications

The implication of this research is the implication in the educational field. It helps to promote and motivate different sectors for their personal development by the meaningful way. This study assists teachers, experts, curriculum planers, policy makers to understand factors of effective mathematics teaching learning. Following are the implications of this research for effective mathematics teaching learning.

- This study is helpful to those schools which intend to increase the achievement of mathematics.
- This will be useful to the policy formulation for effective school.
- This study is helpful for school administrators to develop clear vision for effective mathematics instruction.
- This study is helpful for mathematics teachers to develop ideal classroom practice.
- This study is helping for educational planer for planning the effective school.
- This study will provide the proper guidelines for the schools which have the low result in mathematics.
- This study could help to understand what kind of teaching materials were used for effective classroom.
- It will be helpful in guiding for other researcher on the various areas of effective mathematics teaching.
- This study will help mathematics teachers for teaching mathematics effectively.

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Appendix-A

Interview Guidelines for Head teachers

Name:	Date:
Address:	Sex:
Permanent:	
Temporary:	Training:
Qualification:	Experience:

The interview with Head teachers was taken on the following main topics to support effective mathematics teaching and learning:

- School administration (planning, organizing, controlling, and staffing).
- Professional development of math teachers
- Time budget and human resource management
- Communication between students, teachers, parents and the related stakeholders.
- Guideline for mathematics teachers for better achievement
- Students' opportunity for learning with teachers.
- Further policy of the school.
- Reward and punishment.
- Extracurricular activities for students.
- View an instrumental materials
- Supervision

Appendix-B**Interview Guidelines for Mathematics teachers**

Name:

Date:

Sex:

Training:

Qualification:

Experience:

The interview with mathematics teachers was taken on the following main topics to support effective mathematics teaching and learning:

- Classroom practice.
- Reward and reforms to students.
- Relation with head teachers, others teachers, and students.
- Problems in teaching mathematics.
- Students learning habit.
- Extra class for students.
- Mathematical materials according to curriculum.
- Assignment and assessment system.
- Support for poor performance.
- Teaching strategy

Appendix-C
Interview Guidelines for Students

Name:	Date:
Address:	Sex:
Permanent:	
Temporary:	Roll No:
Age:	Section:

The interview with students was taken on the following main topics to support effective mathematics teaching and learning:

- Personal history
- Family background.
- Learning opportunity at school.
- Views about mathematics.
- Asking with friends to avoid confusion.
- Group discussion in subject matter.
- Mathematical learning style.
- Achievement level in Mathematics
- Expectation from school.
- Satisfaction with mathematics teachers.
- Teachers' behavior towards students.

Appendix-D
Classroom Observation Form

Name and address of the school:

Date:

Name of the mathematics teachers:

Grade:

Topic:

Period:

No. of the students:

Observer:

Informants	Always	Sometime	Never	Remark
<p>Preparation</p> <ul style="list-style-type: none"> • Planning the lesson on the basis of textbook • Purposeful direction of objectives • Appropriate sequence of content • Measurement tools of classroom achievement <p>Motivation</p> <ul style="list-style-type: none"> • Reward • Classroom interrelation [T/S or S/S both] • Work on groups or individuals • Encouragement and development <p>Teachers Activities</p> <ul style="list-style-type: none"> • Encourage students • Discuss with the students • Listen to students opinions • Nonverbal communication • Solve disciplinary problems • Answer to the students <p>Using Teaching method</p> <ul style="list-style-type: none"> • Discussion method • Demonstration • Question answer method 				

Informants	Always	Sometime	Never	Remark
<p>Materials</p> <ul style="list-style-type: none"> • Textbook • Curriculum • Reference book • Teaching guide <p>Audio-Visual Materials</p> <ul style="list-style-type: none"> • Black/ White board • Flannel board • Notice board • Graph board/ paper • Charts/ paper and table <p>Manipulative Materials</p> <ul style="list-style-type: none"> • Scale, setsquare, prism, pyramids, etc. <p>IT Based Materials</p> <ul style="list-style-type: none"> • Calculator • Computer • Projector • Mathematics Software (Geo-gebra, Mathematica etc.) <p>Assessment Practice</p> <ul style="list-style-type: none"> • Lesson summarized • Home assignment • Other classwork • Content and objective reviewed <p>Physical Facilities</p> <ul style="list-style-type: none"> • Inadequate Furniture • Peacefulness • Lighting system • Partition of the class • Drinking water • Adequate school building • Adequate space for students to seat 				

Appendix-E**List of the Case Students and their Profile Details**

S.N	Name of Students	Address	Gender	Ethnic/Caste	Parents Name
1	Kajal Shah	Janakpur-6	Female	Sah	Mr. Binod sah
2	Anusha Thakur	V.D.C.devdidas	Female	Bahun	Mr. Amarendra thakur
3	Ram Binay Chodhari	Janakpur-4	Male	Calwar	Mr.Ramji Chodhari
4	Laxmi Shah	Janakpur-4	Female	Sah	Mr. Pawan Sah
5	Dipak Yadav				
6	Ashwin Jha	Airpot chook	Male	Jha	Mr. Nanu Jha
7	Mausami Thakur	Janakpur-4	Female	Sunuwar	Mr. Kailash Thakur
8	Aastha Thakur	Gaungali-6	Female	Bahun	Mr. Sanjay ku. Thakur
9	Priyanka Gupta	Janakpur-4	Female	Haluwari	Mr. Ajay Gupta
10	Kiran Thakur	Janakpur-4	Female	Sonar	Mr.Sujeet Thakur