

## **Chapter -I**

### **INTRODUCTION**

#### **Background of the Study**

Mathematics and human life are related to each other like a relation between muscles and bone of human body. Many people define mathematics in different views. The meaning including teaching mathematics is like a language which is basic tool of communication. It is essential for every day as well as for higher study in the field of science and technology.

In this modern age nobody can live without the knowledge of mathematics. It is intimately involved in every moment of every one's life. Everybody wants to make his/her life successful. By the knowledge of mathematics and its logical structure everyone becomes able to self evaluation which provides him assessment, judgments, guidance and direction for the further. Everybody has to face different mathematical problem of his daily life. Mathematics makes a man creative constructive, productive and innovative. Mathematics education is a modern discipline. Many people says that mathematics and mathematics education are both same. But mathematics and mathematics education are two disjoint disciplines by their virtues and nature. Mathematics education deals mathematics from the philosophical, psychological and sociological aspect of education.

In Nepal, the implementation of National Education System Plan (1971), mathematics has been given a significant place at all levels of school education system. Out of total time for instruction in the school, about 30 percent is allocated to mathematics at the primary level. The main objective of primary level mathematics is to develop necessary mathematical skills for solving practical problem of daily life. It is regarded as the entire basic foundation which is prerequisite to the next level. So

primary level is just like a foundation of building without which there can't be educational structure and system. This level is considered as very important for the children in the process of educating them from school as well family.

Everyone has right to education. Education shall before at least in the elementary and fundamental stages. It signifies that education is for all and not for a selected few. This concepts accepts that education is the birth right of every child. This means all children belonging rural areas and in places which are accessible with difficulties have to be provided with facilities for elementary education. Without teacher training, a teacher can't teach his/her students effectively. Teaching is the process of behavior shaping because the training makes a teacher perfect in his/her classroom teaching. Training and education are the two parts of a coin. They are related to each other. Training is related to skill and education is for decision making as well as predictions. Training helps the teacher to identify the student's aptitude, interest as well as their learning problems. Teacher training is pre-requisite for good teacher. So that the teacher training is essential for mathematics teacher

Training is a tool that changes the behavior of the teachers. Also develops skill, aptitude, knowledge of their educational needs. In the context of Nepal teacher's training are given for the professional development of teachers at the beginning point. For the primary teachers 10 months teacher preparation course is given to fulfill the objectives of entrance course of curriculum. For the Lower Secondary and Secondary Level, the teacher should have got the practice teaching on the level as well as bachelor level. According to Baral (2063), Training enhance the knowledge, skills and Aptitude. Training encourages to the teachers and to increase teacher's ability. According to Robins and D.Senjo (2005), learning experience is training from which a

person can solve every types of problem in every situation. Ability, skills, knowledge concept development and behavior changes are the bi-product of training.

For the professional development of secondary teachers, principals, educational administrators and educational supervisors the college of education was established in 2014 on the basis of NNEPC (Nepal National Education Planning Commission 1954). Now days it is known as the faculty of education with its' separate identity in higher education. Teacher training helps the teachers for inclusive teaching from which every type of students will get the access of education. Pre professional, professional and refreshment training are the parts of training. In Nepal formally teachers training was started in 2004 B.S. Basic teacher training centre was established on 14th Bhadra, 2004 B.S in Tahachal, Kathmandu. That was the first training centre of Nepal. The faculty of Education was started to provide teacher training for lower secondary level since 1987 A.D. In service training in science and mathematics was run by Science Education Development Project (SEDP) under the ministry of education since 1993 with the assistance of loan from Asian Development Bank (ADB). The main objective of the project was improving the quality and efficiency of secondary education of Nepal. The duration of the training package was 10 months for mathematics teachers. The long-term and short term professional training program for lower secondary and secondary level teachers was organized by Tribhuvan University.

NESP (2028) also promoted the teachers training Education Act 2028 and Education Rule 2059 also emphasis the need of teacher license for teaching. For the professional development of teachers there were so many programs lunched in Nepal. Seti project, BPEP(I), BPEP (II), TEP were major programs. Though the primary education development program 10 months teacher training was lunched. All the

teachers have taken teaches professional development till 2066 B.S from NCED. According to the educational report of Nepal (2059), teacher training has given through distance education from radio with the cooperation of Nepal and Asian Development Bank.

NCED was established in Nepal in 2050 B.S for the motto of primary teachers training and educational management. Now there are nine primary teachers' training centres in Nepal. Form the implementation of TPD the curriculum for the training has been organized. In Makawanpur NESP (2058) was lunched at last phase. At present time different types of teachers professional development training has lunched. That has promoted the teacher's skill, aptitude, knowledge and extra activities as well as teaches are being creative day by day. Government of Nepal has spent millions of Rupees in the area of teacher's professional development training. Though there are qualified and trained teacher in community schools, the result seems to be very poor in comparatively than that of the private schools. Student and their parents are generally losing their trust from community school. So that this research was concerning with the impact of TPD training on mathematics teaching in our schools.

### **Statement of the Problem**

At present condition of Nepal, the educational level of government schools has low quality. The attraction of boarding school shows that the quality of private school is better than the government school. For the quality education teachers should be trained and should be responsible to their profession. They also should be able to think about inclusive educational environment for quality education, quality of resources and qualified tools are essential. But in the condition of Nepal they are limited only upon seminar and training.

Previous study and research has shown that trained teacher has taken different types of training though they are not able to teach effectively. The achievement level of students has not increased. They haven't teach effectively and as the interest of the child. They are not able to teach effectively and are not able to use educational technology. The behavior of students had not changed so that I had chosen this topic for the study. The government of Nepal has spent lots of money for their students but the educational status of the students has not changed perfectly. So that the research had been concerned here. Teachers have taken training and implementing in classroom but educational problems remains same. So that to study these more aspects I had chosen this topic to answer the following research questions.

### **Research Questions**

- Does TPD training affect teaching learning strategy of Mathematics?
- How does the TPD training affect in Mathematics teaching learning activities?

### **Statement of Research Hypothesis**

The hypothesis formulated by the researcher for this study was as follows.

- There is no significant difference between the teaching learning activities of trained and untrained teachers.
- TPD training doesn't affect the achievement of students.

### **Objectives of the Study**

The objectives of this research were as follows.

- To examine the effect of TPD training in teaching learning strategy of Mathematics.
- To explore the situation of trained teachers in teaching learning activities.

## **Significant of the Study**

Different studies and researches were important for their own field. This study was lunched to find the impact or effectiveness of teacher's training so that it had significance in the field of education. Training is means but not the ends. It helps the teacher to teach effectively. Teacher is base of education system. For the all round development of the students, the teacher training is the most essential tools. To change the behavior of students, for the educational improvement of the society, effective teaching is essential. Teaching is an art. Nobody can teach effectively if he hasn't taken training.

The government of Nepal has spent so much money in the field of education. Lots of money is spent on teacher training in every year. The frequency of teacher training has been increased. The student who goes to school becomes happy if teachers don't teach. On the other hands the students becomes sad if the teacher enters the class. To find the impact or effectiveness of TPD training, this research would be conducted. Because of these reasons the study should be done. At the present condition of Makawanpur, most of the teachers had taken TPD training. The result of SLC as well as loser Secondary was not sufficient. I had studied the literatures on the basis of TPD trainings, like thesis and I had chosen the subject that the impact of TPD training on mathematics teaching. In this research I had analyze the impact of TPD training and achievement of the students as well as the teaching style and would find the actual situation on their teaching. I wanted to study the actual teaching style of the trained teachers and style about their experience. Government of Nepal has spent lots of money on teacher's professional development training. I wanted to study about its effectiveness. Many people had done the research on different places but no one has done in this place. So I wanted to study the impact or effectiveness of TPD at this

selected place. Because of these reasons I had chosen this topic and place. From the above reasons I think this research would be very significant.

### **Delimitation of the Study**

To conduct this research so effectively and make simplicity, concerning different situation, the researcher would have bounded the area of this research. Because of the limited sources and time as well as the researcher had to complete in a certain time with a small economic investment and had to utilize the locally available materials. The following points were the delimitation of this study.

- This research was concerned with two resource centres of Makwanpur district.
- This study was delimited to public lower secondary school as well as secondary level of selected resource centers.
- This study had included only eight grade pupils taught by trained and untrained teacher.
- This study was able to examine only the scores of the students attained from annual examination of grade eight.
- Secondary data were used to identify the achievement scores.
- The schools that were launched by the government facilities were selected or only the public schools of Makawanpur district were selected in this study.
- Questionnaire, classroom observation from and checklist were the tools of data collection.
- This research was concern with survey design.
- Some of the variables like classroom situation, age group, IQ, Socio-economic status and experience of teachers were not controlled.

## **Operational Definition of the Terms**

Definition of some related terms were defined briefly as follows:

### **Public School**

A public school is a government aided school, which runs along with the support of local people. Nepal government provides 100 percent of the salary to the teachers.

### **TPD Training**

TPD training is the training which is given to the teachers to promote their teaching skills. A planned and systematic effort to develop knowledge/skill/attitudes through learning experience to achieve effective performance in teaching mathematics at lower secondary level.

### **Descriptive Statistics/Analysis**

Descriptive statistics/analyze is the process of quantitatively describing the main features of information.

**Resource Center:** The center where the TPD training has been conducted.

### **Resource Person**

A Person who facilitates the teachers for teaching and manages the programs of the schools.

### **NCED**

National Centre for Educational Development which gives the training for teacher and develops the materials for training.

**DLE:** District level examination of class eight of Makwanpur.

**Impact:** In this study impact refers to the influence of TPD training in teaching, learning and achievement.



**Lower Secondary level**

The level of students, who gets knowledge of grade six, seven and eight. In other words, the students of age ten years to twelve years.

**Trained Teacher**

The teacher who has passed one /two/three years Bed or who has received ten months in service training after completion of his/her bachelor's degree not from education faculty.

**Untrained Teachers**

Teachers who haven't taken TPD training yet are known as untrained teachers. The teacher who has not received above mentioned training and has passed their bachelor's degree from other faculties like science, arts and commerce.

**Private School**

It refers to the schools that are conducted by a particular person or group and does not receive the government grant for management and other purposes.

**Lower secondary Level Mathematics Teacher**

The teachers who teach mathematics at classes six, seven and eight are considered as the lower secondary level mathematics teacher.

**Retention**

Retention is a memory term which is generally the ability to continue doing something after a period of not engaging in the activity.

## **Chapter-II**

### **REVIEW OF THE RELATED LITERATURES AND CONCEPTUAL FRAMEWORK**

#### **Review of the Related Literature**

Research is a continuous process as well as dynamic process. Researcher should study books; journals, thesis, articles, newspaper, flash, bulletins as well as related materials on the basis of the research topic from that study the researcher can find the conclusion of pre research on the basis of same or different topic. The researcher should study the findings and conclusion of the research that has done by previous persons. From this, the researcher can find the actual problems, cause as well as recommendation. So to conduct this research many books, thesis, journals, bulletins and magazines are studied and summarized on the basis of impact of TPD training on teaching mathematics.

It provided clear map to the researcher to move ahead and to find the direction easily. It actually gave the researcher proper direction. Literature review had helped to conduct the new research in systematic manner by providing the general outline of the research study and avoid the unnecessary duplication. The purpose of this chapter was to review literatures related to the topic of this study. Some of the literatures related to this study are listed below.

Adhikari (2008), had done a thesis on the topic “Effectiveness of training in classroom activities”. That has concluded that teachers have collected many skills and experiences from the teacher training. Teachers were using their skills and knowledge gained on the training that had made their teaching effective and it had helped the teacher to manage the classroom like emphastructure and student management. It

helps to evaluate the students and the way to give and check homework as well as providing feedback.

Amatya (1978), made a comparative study on the topic "effectiveness of Teaching Mathematics With and Without Use of Instructional Materials". He had taken 60 students in which 30 students were in control group and 30 students were in experimental group. The Experimental group was taught with the use of instructional materials and the control group was taught without the use of instructional materials. At the end of the constructions, both group were administrated and taken achievement test. The average scores were found and compared for determining the effectiveness of the treatment variable. The pre-test had multiple choice questions each consisting of four distracters, the questions were open sentences from the four simple rules and simple fractions as prescribed for the 2nd grade. The post- test had fractions, the difference in the main achievements non- tested by statistical method. Lastly, he conclude that the performance of the students taught with the use of instructional materials was significantly improved when compared with the performance of the students taught without the use of instructional materials.

Kafle (1998), studied "Trends in Mathematics Achievements of the Lower Secondary Students in District Level Examinations of Kathmandu District" to find out the mathematics achievements of lower secondary students from public and private school. The method of sample selections was purposive. He took 13 public and 18 private schools as sample. The findings of this study were: there were remarkable variations in terms of mean score, standard deviation and pass percentage of the students of private and public schools, in mean scores between public and private schools. The students of private schools were superior in learning mathematics than the students of public schools.

Lamichhane (2010), did a research on the topic "The effect of Teacher Training in Mathematics Achievement at secondary Level" in Tanahun District. The objective of this study was to find out the effect of teacher training on mathematics achievement at primary level. The sample size of this study was 56 students of class 10 of private schools. He concluded that the mean achievement score of students taught with using different training skills was higher than the mean achievement score of the students taught without using different training skills.

Mukhiya (2000), did a research study on the topic "A Study on the Effectiveness of Training on the Instruction of Transformation Geometry of Secondary Level Mathematics". The objective of this study was to analyze the effects on training on the instructions of transformation geometry. The study was conducted on Sindhupalchok District for the 35 sample secondary level mathematics teachers. The researcher concluded that teacher from 3 years B'Ed program was better than one year Bed and B.Sc while teaching the concept of transformation.

Neupane (2005), had concluded on his thesis on the topic of Impact of training on school that trained teachers are more creative and active in every extra activity. By the view of teachers, principals and social leaders; all the teachers are responsible for the betterment of school and community through trained teachers were more active for all activities. Neupane's view was not similar to the view of Sharma and Sharma because Sharma emphasis the responsibility of teacher on their profession but Neupane emphasis that trained and untrained teachers have no different in social activities and the future of the school.

NCED (2006), had done a study on the topic "Effectiveness of Primary Teacher Training in Nepal". It concludes that materials developed by NCED for the training of primary teachers are not experience based lack of interesting in

presentation, low use of chart, figures and materials are not locally. The conclusions of NCED and Neupanewere similar that both of them emphasis that trained teacher has played vital role and more active role for the extra activities of the students.

Phuyal (1998), did a research study on the topic "Teachers Training and its Implication in Classroom Practices", a comparative study between public and private primary schools conducted on Dhading District for the sample of 25 schools. The design of this study was experimental; the selection of sample was purposive. Concluded trained teachers were not using their training capabilities in classroom instructions and teaching techniques of both private and public primary school were not much different. Also, in private schools, the student scored the highest marks in English.

Parajuli (2009), did a research on "A study on the Effectiveness of Teaching Mathematics by Using Problem Solving Method at Secondary Level". with the aims to find the effectiveness of the problem solving method of teaching mathematics at the secondary level and compare the achievement scores of the students taught using problem solving method in which experimental research design was developed. The researcher constructed an achievement test, which consisted of 19 items of which 13 were objective and 6 were subjective questions. He used experimental and control group, mean, standard deviation and variance to analyze the collected data. The researcher concluded that the achievement of students taught by using problem solving method was significantly higher that the achievement of students taught without problem solving method.

Teaching is a respected and higher level profession. So that the higher level of skill, ability and education is required for a good teacher. From the above review of the related literatures the researcher can conclude that training is very important for

teacher to teach effectively. Training creates the feeling of confident in the mind of the teacher. So that, they can teach effectively. There are sufficient programs for teacher training but they do not follow what they have learnt from the training. The previous researchers have indicated various factors that had blocked to transfer training from one situation to another situation. In the contained of Makwanpur district, there doesn't seem even a single research on this topic. There are sufficient numbers of training programs of mathematics in this district but the result of the students are not sufficient. Lack of sufficient researcher and proper implementation of TPD training, still there are several problems concerning mathematics teaching and learning. Education plays the vital role in different field. In conclusion trained teacher is a person who has learned different skills and teaching strategy. S/he can teach effectively and they can encourage the students and motivation towards teaching learning activities as a result teaching becomes faithful, curious effective, lived experienced as well as inclusive.

### **Conceptual Framework of the Study**

Conceptual Framework deals about researcher's own concepts to conduct the research in an original way. This study deals with the effectiveness and impact of teacher's professional development training to apply the behaviors, knowledge and skills. TPD training is based on the theory of transfer of learning. Transfer of learning occurs whenever the effect of prior learning influences the performance of the later activities. Trainee teachers can successfully apply their knowledge in their jobs and skills gained in training situation.

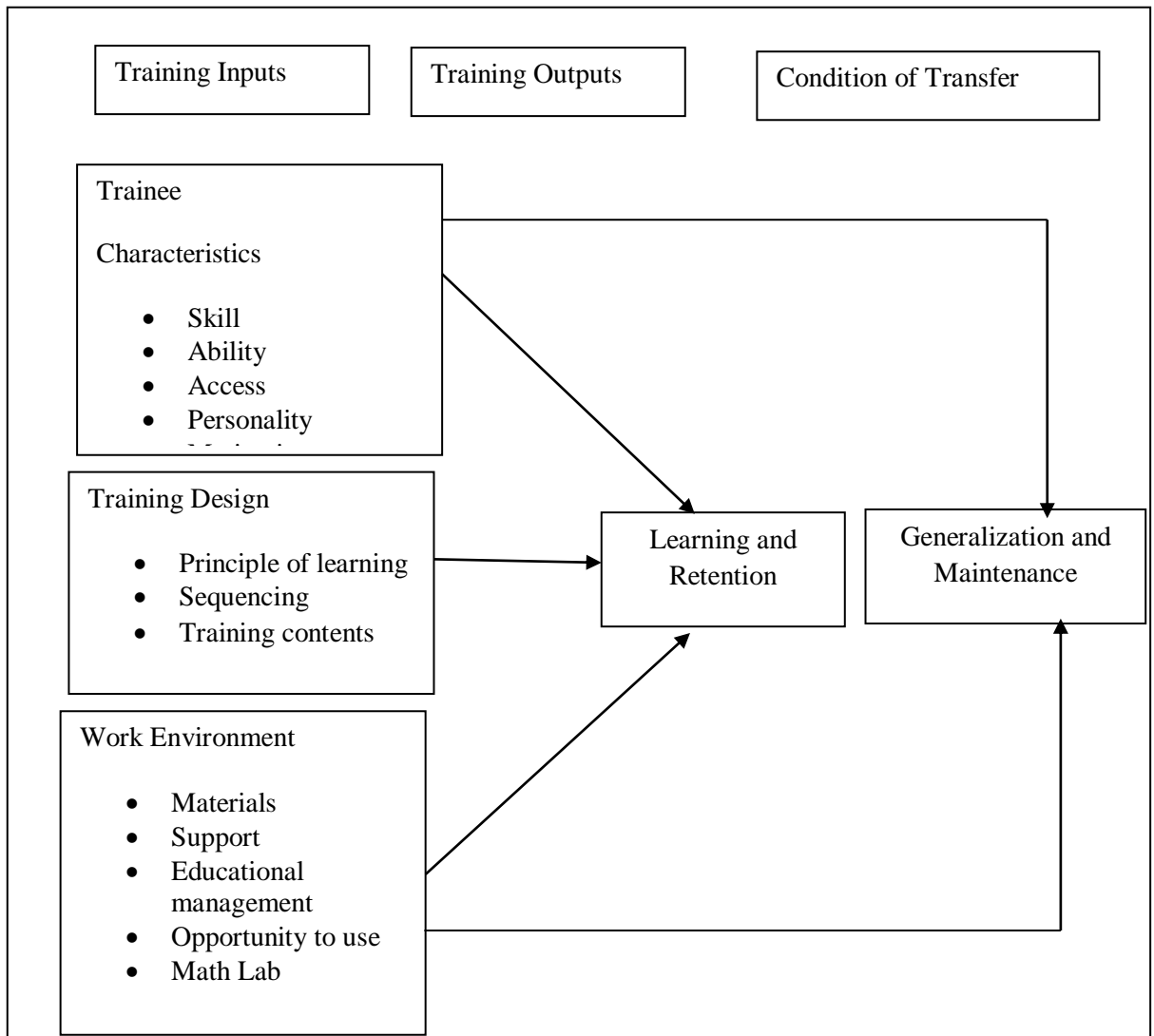
For the effective teaching learning activities of school we need trained teachers. They play the effective role as educational leader. For the further learning of pedagogy and science and technology teacher should take training and school

management committee should provide the chance of training. To provide educational access for all students the government has spend a lot of money on the field of education. Teachers training have been given for all the teacher of primary level as well as upper level. There should be supervision as well as continuous feedback too. Teacher's professional development training improves the learning rate of the students. Teaching becomes more effective and interesting. It plays the positive role and motives the students towards learning. Trained teachers can apply their knowledge practically in the class so that it helps to fulfill the objectives of curriculum. If teachers are not trained then the students dropout rate will increase and we cannot fulfill the objectives of EFA. Ministry of Education emphasis that trained teacher only can teach effectively. So that in +2 level as well as bachelor level we need to study education and practice teaching compulsory to become teacher. Teacher license is necessary for the teaching profession. 'ShikshakMasik' has written that teacher training helps the teachers to improve the behavior of students and educational development so that the government specially the ministry of education has spend a lot of money on teachers training to give education for all. The motto of teacher training is to provide the access of Education for all through inclusive teaching.

The framework of this research was based on the training transfer model of Baldwin and Fords. Baldwin and Ford's Transfer of Training model (1988) was based on the idea that included trainee's characteristics, training design and work environment. An important point in the model was that the outcomes of training were impacted by trainee's characteristics and work environment. The transfer of training model would have made evaluable contribution on the study of training transfer. The component included within the three topics that are training input, training output and conditions of transfer are directly related to each other.

The diagrammatic representation of Conceptual Framework is shown in the diagram below:

**Baldwin and Ford's Training Transfer Model (1988)**



(Source: Lamichhane,2010.)

From the above diagram training inputs includes trainee characteristics, training design and work environment. Each of the five inputs given in the framework indicates their component elements, skills and access of trainee, ability, personality and motivation form the part of trainee characteristics. The second input is training design, which shows the principle of learning, sequencing and training content. Work environment includes materials support, educational management, opportunity to use



and math lab. It is important to say that the training inputs have direct effect on the condition of transfer. They indirectly affect transfer of training with the help of training outputs, which is known as learning and retention. The lines connecting various boxes shown direction of relationship and their linkages. The framework of this model would be used to describe the transfer process. The researcher had chosen the Baldwin and Ford's Training transfer model for the study because all the components indicated in the model were applicable and related to the study. To conduct this research easily the researcher had chosen this model. With the help of this model the researcher had collected required data on the basis of trainee characteristics, training design and work environment. There is relation between various factors mentioned above in the diagram. So that this model had helped the researcher to collect and analyze the data so effectively.

For effective training input, training characteristics should be trainee oriented. Similarly, training work environment was needed to be appropriate. Therefore good learning and retention would be possible. Where the learning and retention took place, then the generalization was possible. On the basis of this fact, the researcher had made his questionnaire and checklist of class observation carefully to incorporate those components and to allow the direction shown by it. Components such as ability, personality, motivation etc would be addressed by preparation of lesson, creating learning environment, instructional skills etc.

## **Chapter -III**

### **METHODS AND PROCEDURES**

Before conducting a research, the researcher must be sure about appropriate methods and procedures. This chapter deals with the methodologies which adopts in this research. This chapter has included research design, population of the study, sampling procedures, data collection tolls and techniques as well as data analysis procedure. The following were the methodologies

#### **Source of Data**

In this research I had collected primary data as well as secondary data. The data taken from the final examination of district level examination were secondary data where as the data taken from questionnaire, observation had become primary data for the study.

#### **Research Design**

To examine the impact or effectiveness of teachers professional development training mathematics teaching in lower secondary level and to explore the performance of trained and untrained teachers, the researcher would have follow the survey research design, which was of quantitative and qualitative both in nature .

Survey research is the method of collecting information by asking a set of pre-formulated questions in a pre- determined sequence in a structured questionnaire to a sample of individual so as to be representative of a defined population. Survey research is method which studies a large population by selecting sample in the condition of less possibility to study the whole population. So that researcher had conducted this research by using survey design.

### **Population and Sampling Procedures**

Among 18 resources centers of Makawanpur district, the researcher had chosen two research centers as the population. All the government school of Shree Sharada Higher Secondary School Resource Center and all the government school of Shree Janapriya Higher Secondary School Resource Center were the population of the study. There were 58 government schools in the two resource centers. All the mathematics teachers of lower secondary and all the students of grade eight were the population of this study of selected resource centers.

The researcher had selected purposively 28 lower secondary schools as well as secondary schools. In which 14 schools having trained mathematics teachers and 14 untrained mathematics teachers. Also for the sample of students from 28 sample schools, 140 students would be selected on the basis of stratified random sampling method. In which 70 students who were taught by trained teacher where as 70 students were taught by untrained teachers separately.

### **Data Collection Tools and Techniques**

For the required data collection, the researcher had chosen different data collection tools to collect primary data as well as secondary data. Every study requires appropriate tools, instruments for data collection. In this study the researcher had used mark ledger/ annual result of grade eight students' of the academic year 2071 and observed the classes of sample teachers where the researcher used checklist and questionnaire as a instrument to collect data. Data collection tools used as instruments to collect data were as follows.

### **Questionnaire**

At first the researcher developed the tools himself and had discussion in a small group of experts and thesis guide to make the questionnaire clear, concise and

easy to use in the field. To find actual data, the researcher had used questionnaire. It had helped the researcher to find the primary data from the sample. Bounded questions were submitted in the questionnaire. Before collecting data through questionnaire, I had visited the expertise and thesis guide to discuss about questionnaire and make them clear and make easy to use in the field. By receiving feedbacks from the thesis guide and expertise, the researcher had improved the questionnaire and gave them a final form. After that the researcher had used them in actual field to collect information and data.

### **Mark Ledger / Annual Result of Grade VIII**

To examine the impact of teacher's professional development training, this was a perfect tool for data collection to meet the objective of this research. . This would be a perfect tool for data collection. It gives the secondary data for the research.

### **Checklist/ Classroom Observation Form**

The researcher had used the classroom observation form to collect data from the teacher that what is the behavior of trained teacher, actual situations of teacher's performance. It is another effective tool to collect required information and data that the researcher has already used for this study. It helps to collect data about starting class, use of materials, teaching methods, technology, use of textbook, classroom environment etc. It was an effective tool to collect required information and data that helps to find out current status of training transfer in the actual classroom after the 10 month's in-service training.

### **Determination of Validity and Reliability**

To collect valid and reliable data, data collection tools should be valid and reliable. So that data collection tools were done on pilot-test on small group of

population. The researcher had done a pilot test on sample school for testing the validity and reliability of the data. After piloting the test the tools had been improved. Reliability and validity of the test would be determined by the help of expertise with their recommendation.

### **Data Collection Procedure**

To collect valid data for the study, the researcher had visited the leader resource centre and had got the records of trained teachers in lower secondary level as well as untrained teacher's record. The researcher had visited the district education office of Makawanpur and had done a request to get the record of mathematics teacher of selected two resource centers as population. The researcher had done the request to the district education officer to give a request letter for the help needed to the researcher from school administration. For the collection of data the researcher had got the ledger of class eight from the district education office. To collect data the researcher had visited each of the sample school along with the Checklist/ observation form/ questionnaire and the request letter. After out planning the motto or purpose of the visit, the researcher had distributed questionnaire to the teachers as well as collected their views and behavior of mathematics teachers which was indicated in the questionnaire. Also the researcher asked for the permission to get data from each sampled teachers to observe their behaviors. After getting permission through checklist also the researcher had collected the result of the students of grade eight of the final examination of 2071 to compare the impact of mathematics achievements of the students taught by trained and untrained teacher.

### **Data Analysis and Interpretation Procedure**

Collected data was analyzed and interpreted with the help of statistical techniques. The collection of information about student's annual achievements and

the data collection through the teacher's classes were completed, they were tabulated in order to make information processing easier and to calculate them using mathematics formulas. Different data was collected from different persons and that were analyzed and interpreted with the help of statistical techniques. The collection of information about the students' annual achievements and the data collected through observation of teacher's class were tabulated in order to make information processing easier and to calculate them using mathematical formulas. Concerning the objectives of the study in priority, the collecting information would be categorized into two groups so that it became easy to interpret.

Z-Test measured the validity of difference between two means. It was used for the comparative study of two variables. The data which were collecting through mark ledger was analyzed by applying mean and standard derivation to fulfill the objectives of this study. Significance was tested by using two tailed Z-test. The statistical device two tailed z-test was applied at 0.05% level of significance. This indicates that if z-value at 5% level of significance for every academic year is equal or more than 1.96 then there is significant different in the achievement of students taught by trained and untrained teachers. The collected data through questionnaire and classroom observation form were tabulated first and the researcher calculated the mean weight age of the responses given by the sample teachers. The weights age 5, 4, 3, 2, 1 were used or assigned for the statements strongly agree, agree undecided, disagree and strongly disagree respectively. The total score for five points Likert scale is 15, thus its average score is 3. So the rule of thumb for determining performance is 3. If the calculated value is greater than 3 or near to 3 then it is calculated that the statement contains it's strong favor for the performance of the teacher. If the index measure is  $\leq 3$ .i.e less than or equal to 3, then it is weak favor to the performance of teachers. The

researcher had calculated the mean weight age of the response using the following formula:

$$\text{Mean Weighted} = \frac{\text{Total Rank Score Of The Students}}{\text{Number Of The Respondents In The Sample}}$$

Each statements of the questionnaire were studied and if the calculated value of mean weighted is greater than 3 then it is a favorable performance. On the other hand, if the mean weighted is less than or equal to 3 then it is less favorable performance. Also the retention of the training were analyzed with the help of weighted mean and analyzed with the help of teacher's observation.

## **Chapter-IV**

### **ANALYSIS AND INTERPRETATION**

This chapter deals with the statistical analysis and interpretation of the data obtained from annual result of the students of DLE as well as questionnaire and classroom observation. This includes the analysis and interpretation of mathematics achievement of the students of Grade VIII taught by trained teacher and untrained teachers. The collected data are tabulated and analyzed for the study of attainment of the objectives and verification of the research problems as stated in the statement of the problem. Analysis and interpretation of data were made by statistical procedures using mean, standard derivation, coefficient of variance and z- test with two tailed at 0.05% level of significance.

This is a quantitative research related to the impact of TPD training on mathematics teaching. The objectives of this study were to examine the effect of TPD training on mathematics teaching and to explore the situation of trained teachers in teaching learning activities. It deals with statistical analysis and interpretation of the data obtained from the scores of the students on which 35 students taught by trained teachers and 35 untrained teachers of 28 sample schools by purposive sampling method. The methodology used for the purpose of this study is quantitative approach in the form of questionnaire, observation form and make ledger of grade VIII. These data are tabulated and analyzed using mean, standard derivation and two tailed z- test. At the time of analyzing the data focus has placed on transfer of training skills acquired by the trained teachers who has taken 10 months training of lower secondary or secondary level training packages. Also the transfer of training skills has been analyzed and interpreted in this chapter. The researcher has collected the data so



carefully with the help of these instruments and researcher has analyzed the data in the following ways.

### **Comparison of Achievements of Students Taught by Trained and Untrained Teachers**

Achievement of students taught by trained and untrained teachers in terms of mean, standard derivation and z-scores are shown in the following table.

**Table: 1 Statistics of Student's Mathematics Achievement**

| <b>S.N</b> | <b>Group of Students</b>    | <b>No of students</b> | <b>Mean</b> | <b>S.D</b> | <b>Z-test</b> |
|------------|-----------------------------|-----------------------|-------------|------------|---------------|
| 1          | Taught by trained teacher   | 70                    | 54.13       | 17.64      | 2.53          |
| 2          | Taught by untrained teacher | 70                    | 47.35       | 19.30      |               |

The table given above, shows that the mean score of the students of the final result of grade eight taught by trained and untrained teachers. The number of sample students taught by trained teachers is 70 and the number of students taught by untrained teacher is 70. The average mean score of the students taught by trained teachers is 54.13 and untrained teachers is 47.35. The difference between the mean score of the obtained marks is 6.78. This shows that the mean score of the students taught by trained teacher is higher than the mean score of the students taught by the untrained teacher. Similarly the standard derivation of the students taught by trained teachers is 17.64 whereas the standard derivation of the students taught by untrained teacher is 19.30. This shows that the standard derivation taught by untrained teacher is higher than the standard derivation taught by trained teachers.

This concludes that there is uniformity in the obtained marks of the students taught by trained teachers than the untrained teacher. From the above table it is

observed that calculated z- value 2.53 is greater than tabulated z-value 1.96 at 5% level of significance. Therefore, there is a significance difference in the mean achievements of students taught by trained teachers and untrained teachers. This means that the students who are taught by trained teachers have better achievement than the achievement of students who are taught by untrained teachers, according to the data.

### **Activities of Mathematics Teachers in Classroom**

Teaching is an art and teachers are artist. Teaching is technological and psychological work. Teacher teaches the students to make perfect in every activities and for all round development. Teacher should have different types of skills to make their class so effective and interesting. Some of the most important teaching skills are; skill of introducing, lesson, skill of using instructional materials, skill of using technologies, skill of explanation and giving examples, skill of motivation, skill of inclusive teaching as well as skill of clearing the lesson etc. The knowledge of ages, stages, experience of teaching and few skill of teaching helps the teachers to teach mathematics effectively. Most of the teachers in the context of Nepal are not able to use teaching skills in classroom due to many reasons. The present study is to identify the classroom performance of lower secondary level of mathematics teachers of Makawanpur district.

The researcher has taken data with the help of classroom observation and he has analyzed that most of the teachers have clear voice with attractive physical personality. The 64.28% teachers of trained teachers had been using teaching materials as well as technology where as 50% teachers of untrained teacher as used teaching materials perfectly. The 85.71% of trained teachers and 75.57% of untrained teachers were able to motivate the students in their teaching. The confidence level of

trained teacher was more than that of untrained teacher. The 92.85% of the trained teachers were able to clear to the objective of their teaching lesson where as only 50% teachers were clear to the objectives of the lesson. The researcher has found that mostly the teachers have good command in subject matter of trained and untrained teachers. Among them 64.28% of trained and 57.14% of untrained teachers could teach on the basis of sequence and series that they were very good in command of sequential series. Participation of students in the class of trained teachers were 92.85% as very good, where as the participation of the students in the class of untrained teachers were 71.42% as good. The 78.57 % of trained and 71.42 of untrained teacher were using math lab for experiment of mathematical content that they were very good. Evaluation procedures and assessment techniques of trained teachers were very good which was 92.85% of total teachers but the evaluation procedure and assessment technique of untrained teacher was only 71.42% as very good of untrained teachers. The research shows that the number of trained teachers are greater than the number of untrained teacher in each topic like as subject matter, use of materials, activities, technology, motivation, assessment and feedback as well as in the field of the end of the lesson as well as the sequence and series of the content.

From the classroom observation it has found that 85.71% of trained teachers and 91.42% of untrained teachers were in attractive physical personality. Most of the trained teachers as 77.14% of trained teachers were confidence in their subject matter where as 62.85% of untrained teachers were very good in their subject matter. Most of the trained and untrained teachers are of satisfactory in the curriculum of mathematics. The 68.57% of total teachers were using local materials and very few numbers of the teachers as 7.14% of total teachers were using technology in their

teaching. Trained teachers were greater than untrained teachers in the field of guidance and counselling.

### **Teacher's Beliefs and Attitudes/ Trainee Characteristics**

View, attitudes or the characteristics of the mathematics teachers towards the training transfer of mathematics is teacher's beliefs and attitudes. Some attitudes and characteristics of the teachers collected through questionnaire and classroom observation from are described below. These data are the primary data for this research. The researcher has collected meaningful data with the help of these tools.

#### **The Weighted Mean of the Statements are Tabulated Below in the**

| <b>S.N.</b> | <b>Statements</b>   | <b>Weighted Mean</b> |
|-------------|---|----------------------|
| 1           | I am happy because I am a teacher.  | 4.57                 |
| 2           | Teaching is an art.   | 3.87                 |
| 3           | Teaching is a responsible profession.   | 4.28                 |
| 4           | Teaching is psychological work.   | 3.52                 |
| 5           | I love children and enjoy with them while teaching.   | 3.85                 |
| 6           | I make lesson plan daily  | 2.37                 |
| 7           | I make and use teaching materials frequently to motivate the students to make mathematics more meaningful | 2.34                 |
| 8           | Students can learn best if they are punished regularly for learning satisfactorily.                       | 2.36                 |
| 9           | Teacher can determine the future of nation.   | 4.37                 |
| 10          | Teaching profession is better than other profession.  | 2.83                 |
| 11          | Teachers are respected from the society.  | 3.57                 |
| 12          | I always select low cost and no cost materials as well local  | 2.89                 |

|    |   |      |
|----|---|------|
|    | materials.  |      |
| 13 | I believe that motivation is essential for teaching mathematics.              | 3.24 |
| 14 | Teacher should do evaluation day by day.                                      | 4.32 |
| 15 | Formative evaluation or continue assessment system is necessary for teaching. | 3.87 |

In the response of the statement, "I am happy because I am a teacher" The weighted Mean of this statement is 4.57. 89% of the total respondents are strongly agreed with this statement of this study. This is also the most positive statement of this study. The interpretation and analyzed collected data, the researcher drew the conclusion that teaching profession has made the teachers respectable and so responsible. Most of the teachers are happy in their teaching profession.

On the response of the statement, "Teaching is an art." The weighted Mean of this statement is 3.87. The 71% of the total respondents are strongly agreed with this statement. 11% of total respondents not agreed with this statement where as 7% of the total respondents undecided and 4% disagreed also 7% of total responds strongly disagreed. This is also the most positive statement of the study. So by the interpretation and analyze of the data the researcher drew the conclusion that teaching is really an art.

In reference to, "Teaching is a respectable job". The weighted Mean age of this statement is 4.28 and 82% of total respondents are strongly agreed with this statement. This is also the most positive statement of this study. So by the interpretation of the collected data, the researcher drew the conclusion that teaching profession has made the teacher so respectable in their profession.

In response to "Teaching is psychological and technological work". The weighted Mean of this statement is 3.52 and 70% of total respondents are strongly agreed with this statement. This is also the most positive statement of the study. In this statement trained teachers more strongly agreed than untrained teachers. So by the interpretation of the collected data, the researcher drew the conclusion that teaching profession is not a jock but is psychological and technological work.

In response to "I love students and enjoy with them". The weighted Mean of this statement is 3.85. The 71% of total respondents are strongly agreed with this statement. Among them, the number of trained teachers were more than the untrained teachers to the support of this statement. So from this interpretation we can conclude that there is collaboration and constructive environment between teachers and students.

From the above responses we can conclude that the teachers are happy because of being teacher. Among different fields of working, teaching mathematics seemed respectable one because many people feel pleasure in teaching mathematics and they are respectable as a symbol of god. Teaching is an arts and teaching is technological work. So the teachers applied child-centered approach to teach in the class. So there should be collaboration and co-operation between mathematics teachers and students. The theory of motivation seemed most important to teach mathematics effectively. Teachers use abstract teaching materials to develop the level of understanding of the students.

In reference to "I make lesson plan daily" The weighted Mean of this statement is 2.37. 57% of total respondents are strongly disagreed to this statement. This is one of the unfavorable statements of this study. The researcher concluded that

most of the mathematics teachers doesn't make daily lesson plan for their mathematics lesson that is also the current trend of our school.

In response to the statement, "I make and use materials frequently to motivate my students to learn mathematics meaning fully". The weighted Mean of this statement is 2.34. 36% of the total respondents agreed with this statement. 39% of the total respondents were strongly disagreed with this statement. This is another one unfavorable statement of this study because 2.34 less than the rule of thumb 3. The researcher has concluded that there is not proper use of materials to motivate the students towards the learning of mathematics.

In response to "Children learn best if they are punished regularly for learning mathematics", the weighted Mean of this statement is 2.36 and 64% of the total respondents were strongly disagreed with this statement. This is an unfavorable statement of this study because 2.36 is less than the rule of thumb 3. This shows that the students can't learn mathematics if the teacher gives punishment. Also the researcher observed the class activities of mathematics teacher and found the actual status of the classroom management of other aspects which directly affect the transfer of teacher training. Researcher has concluded that there is a good interactive relation between students and teachers in mathematics classroom.

### **Planning and Preparing the Lesson / Training Design**

Planning and preparation is the basic part of the classroom activity of instruction. It is the initial phase in the delivery of instruction. So it is directly related to the planning of the lesson and collection as well as preparation of instructional materials to make the teaching learning activities so effective. Planning and preparation provide the teachers an idea of how to develop the key concept and how to correlate them to actual life situation of the students. So the teachers need to be

prepared before entering into the class. From the classroom observation it was found that most of the trained teachers didn't prepare any written lesson plan for a lesson to teach and only few of the total teacher's performance in this aspects was good.

Trained teachers were interviewed to collect useful information about planning and preparation for lesson. While as key the question "why don't you use lesson plan?" Most of the trained teacher said, "I always make plan in my mind but I can't make written lesson plan because of time. I have learnt some new knowledge and skills from training but I can't use their knowledge and technology in the actual classroom activities. Most of the teachers responded that they hadn't prepared instruction plan in written format but they claimed that they were preparing the plan mentally for each contents.

Most of the trained teachers did not have prepared instructional materials for the lesson while observing their classes as a result the transfer of training is not satisfying because the weighted mean of the topic. "Instructional material" was below the rule of thumb 3. Though few trained teachers performance in this aspect was found excellent and other remaining of the performance was found normal only. That mean they prepared few instructional materials. In the informal discussion with trained teacher, it was also found that most of the trained and untrained teachers did not give the attention of preparation of the instructional materials and their use. On the question "Why don't you construct and use instructional materials?" To the trained teacher, Ram Bahadur said, "I have to teach full period in a day and the school found empty. The school is unable to provide different technology and materials to the teachers". Most of the teacher replied that they had to teach full period in school and did not have much time and budget for the instructional materials. Most of the teacher expressed that they did not use instructional materials while teaching. From



the observation of the school environment it was found that trained teachers had less time to think about teaching, preparing plans and developing materials, interacting and sharing experiences with each other. So the researcher concluded that because of these reasons the educational quality of school has become low.

From analyze and interpretation of collected data; it was found that most of the teachers' performance in the area of the planning and preparation for the lesson were weak. Teachers were busy in different activities of the community so that skills regarding the teacher training were not transferred in the class delivery. Impact of TPD training with regard to preparation for the lesson is not sufficient too. Therefore the transfer of TPD training skills couldn't be more useful properly.

### **Creating Learning Environment**

Learners can learn nothing, if there is not child- centered learning environment. During the class room observation the teachers has observed different aspects of learning environment which are described as follow. Trained teacher's classes were observed in order to identify the extent of transfer of training skills regarding creation of conducive learning environment in the classroom. It was found that most of the observed classrooms were narrow with inappropriate light and ventilation provision. It was found that the observed classroom were with relevant materials. There were few materials, chart and teacher made materials in the classroom. 67.84 % of the observed classrooms were found with not relevant materials displaying on the wall. But each of the observed classroom contained whiteboard. There was not well co-ordination between teachers, parents and students. At the time of interview, most of the trained teachers said that they could not able to create conducive learning environment in the classroom and the few number of teachers could create appropriate learning environment. Some teacher said that they

had made their classroom's environment so happy and enjoyable. While answering the question "Why you can't create the appropriate learning environment?" Most of the teachers 23(82%) replied that there was lack of economy, size of classroom were not sufficient and there was not co-ordination among teachers, students and parents.

From the analysis of these data because the lack of appropriate physical environment of the classroom, teaches were unable to conduct learning environment. It also indicated that the trained teachers were not found to have developed skills to conduct learning environment and they had no enthusiasm. This concluded that teacher's training is most important for teacher and that helps the teacher to teach effectively but the teachers are being lazy in their profession.

### **Communication skills in teaching**

Communication is the expression, transmission and interpretation of knowledge and idea on a skillful manner. For the performance of teachers classroom activities were observed in order to identify weather the trained teachers communicate effectively in classroom. It was found that teachers were performing in very simple, clear and simple language. They were excellent in their communication. Among them few of the teachers were found good in presenting subject matter accurately and clearly.

It was found that most of the trained teachers asked questions to the students to check the understanding of the subject matter. All the trained teacher's respondent that they encouraged the students to ask questions. Among them 47% of trained teachers said that they could ask to the students proficiently. Most of the head teachers (near about 70%) replied that trained teachers used simple language in teaching also clear and understandable also they encouraged the students to ask question and learn with collaborative environment. From the above discussion it can

be concluded that trained teacher's transfer of training in communication is satisfactory. This shows that the transfer of training has been interpreted positively. All of the teachers had their own opinion but the trained teachers were perfect in their communication to their students.

### **Summarizing and concluding the lesson**

It was found that the teachers had different summarizing methods and they had different method of conclusion. The mean score of the students taught by trained and untrained teachers are respectively 54.13 and 47.35. Also the standard score of the students taught by trained and untrained teachers are respectively 17.64 and 19.30. It is observed that the calculated z-value 2.53 is greater than the tabulated z-value 1.96 at 5% level of significant. It is found that there is significant difference between the mean achievement of the students taught by trained and untrained teachers. Through the analysis and interpretation of the data transfer of teaching skills on the basis of performance mentioned on the classroom observation form, it can be calculated that the teacher's training has brought changed in the teachers by using various teaching skills effectively and efficiently. Most of the teachers of the sample schools had the views that the teacher training programs were beneficial. They felt that program had helped them in their attempt to find out the weakness of the students.

Use and implementation of TPD training in terms of planning for teaching, creating joyful learning environment is promoting the behavior of students. Application of training in terms of starting the lesson, providing constructive feedback and linking contents to the students previous learning experience are most important. Trained teachers were able to create an environment, coordination of the parents, students and teachers. They helped to manage learning process effectively and students friendly. From the interpretation and analysis of the collected data, trained

teachers were responsible in their teaching. They were able to teach effectively and they had more knowledge of teaching skills than untrained teachers though they were not implementing their knowledge and skills in their classroom. Trained teachers were able to teach by the way of inclusive teaching method than the untrained teachers. So that TPD training has made positive impact in their teaching learning activities.

## **Chapter - V**

### **SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS**

This chapter deals with the summary, findings, conclusion and its recommendation for the related persons and institutes. Recommendation is essential in different level like policy level, practical level and further research. Summary, findings, conclusions and recommendation of this research are as follows.

#### **Summary**

The population of this study was lower secondary level mathematics teachers and students of Grade VIII of two resource centers .These were Shree Janapriya Higher Secondary School Resource Center and Shree Sharada Higher Secondary School Resource Centers. This research was survey research and it was quantitative in nature. The researcher employed stratified random sampling technique to select the sample school and sample students as well as teachers. For this study, 28schools were selected as a sample including 14 schools having trained teachers and 14 schools having untrained teachers of mathematics. Also 70 students of Grade VIII from the schools taught by trained mathematics teachers and 70 students from the schools taught by untrained mathematics teachers were selected. The total number of teachers and students selected for sample were 28 and 140 respectively.

This research was conducted to find the impact of TPD training on mathematics teaching and to explore the real situation of trained teachers in mathematics teaching. The researcher used primary data and secondary data of achievement scores of Grade VIII in the annual examination of academic year 2071. Data were collected through class observation and through questionnaires from the teachers. The collected data were analyzed by the help of mean Standard deviation and z-test for testing impact or effectiveness of teacher's professional development

training in mathematics teaching of grade VIII. Descriptive analysis was done to analyze the information obtained from questionnaire and classroom observation form

### **Findings**

- The mean achievement score in mathematics taught by trained teacher is greater than the mean achievement score of student taught by untrained teachers.
- Most of the teacher didn't make written lesson plan and didn't use instructional materials. Thus the impact of teacher's professional development training in this regard cannot be interpreted positively.
- Only few of the teachers were able to teach on the basis of psychology of the students.
- There were no schools having mathematics lab.
- Teachers gave less emphasis on classroom decoration with relevant materials.
- More than 60% of the trained teachers were perfect in the subject matter of mathematics and they had knowledge of teaching skills with appropriate examples.
- Few teachers could create the joyful environment and they used low cost and no cost materials. Among them most of them were trained teachers.
- There was lack of effective teaching methods like demonstrations, discussion and project work for internalization of some concepts and practical use of these skills during the training.
- Most of the teachers concluded the lesson by giving project work and assignment as a homework and few of the trained teachers closed the lesson by summarizing the lesson.

- Majority of trained teachers (more than 75%) used very simple, clear, understandable language, polite and non-threatening language.
- There was lack of continuous monitoring and feedback from the teachers.

### **Conclusion**

Impact of TPD training in terms of planning for teaching, creating joyful learning environment using low cost and no cost materials to encourage the students for interactive learning and co-operation among students and they were providing constructive feedback and motivation seems very good and useful for teachers. Application of training in terms of commencing or starting class, presenting subject matter, linking content to the student's previous learning experiences, teaching students with love and respect, asking questions, use of clear and non-threatening language seems up to the satisfactory level. The mean achievement of the students taught by trained teachers seems better than the students taught by untrained teachers. Calculated z-value is greater than tabulated value at 0.05 level of significance. So that the null hypothesis had been rejected. From the findings of this research it can be concluded that trained teachers have more techniques and skills of teaching, using materials, motivating students and other extra activities of the students than the untrained teachers. From the analysis and interpretation of collected data it can be concluded that the trained and untrained teachers hadn't use their skills and knowledge because of the lack of infrastructure, teaching materials, lack of technology and system of the school as well as appropriate teaching learning environment. Therefore the achievement of the students taught by trained teachers is more significant than the achievement of the students taught by untrained teachers. So that the teacher's professional development training impacts positively in mathematics teaching at lower secondary schools.

### **Recommendation for Future Research**

The result and the conclusion of this study generate some other questions which is need to verify. Some of them are as follows

- The study of this kind should be conducted at all level of the school.
- Study can be carried out in government school as well as private and community school.
- This study was limited in two resource centers of Makawanpur. So the study should be done in other places of Nepal.
- This study was of survey design with quantitative in nature. Similarly the study should be done in experimental design with quantitative nature as well as qualitative nature.

### **Suggestion for Educational Implication**

Government of Nepal has spent lots of money for teacher's training but the production or implementation of teacher's professional development training is not sufficient. Because of various problems and various related factors; TPD training has not become effective though it has played vital role for teaching learning activities of mathematics. Some suggestions for effective teaching are as follows.

- Special training programs should be conducted for the teachers to teach mathematics effectively.
- Classroom management skills on the part of the trained teachers are poor so that the appropriate classroom management skills should be incorporated in the training.
- Teachers were not using their knowledge and skills gained from training so that the supervision as well as guidance and counseling are needed to the teachers.



- Teachers were not using teaching materials sufficiently so that the resource person and head master should encourage them to use local materials for the implementation of curriculum.
- Students should learn mathematics in co-operative learning environment.
- Teachers should use local materials as well as low cost and no cost materials.
- Teachers should use various teaching methods.
- Teachers use different theories in their teaching such as constructive learning theory, behavior learning theory as well as cognitive learning theory.
- Training is essential for teachers to teach effectively so the different types of training should be conducted for different level of teachers.

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### Appendix –A

#### Sample Students and Their Obtained Marks at Grade VIII inThe Annual Examination of 2014

| <b>SN</b> | <b>Obtained marks of sample students from Group I(trained)</b> | <b>Obtained marks of sample students from Group II (Untrained)</b> |
|-----------|--|--|
| 1         | 88   | 72   |
| 2         | 78   | 56   |
| 3         | 52   | 74   |
| 4         | 38   | 82   |
| 5         | 34   | 38   |
| 6         | 66   | 70   |
| 7         | 52   | 48   |
| 8         | 68   | 52   |
| 9         | 89   | 48   |
| 10        | 72   | 36   |
| 11        | 50   | 52   |
| 12        | 34   | 66   |
| 13        | 86   | 49   |
| 14        | 36   | 30   |
| 15        | 52   | 16   |
| 16        | 56   | 44   |
| 17        | 64   | 21   |
| 18        | 28   | 17   |
| 19        | 15   | 29   |
| 20        | 40   | 68   |
| 21        | 60   | 30   |
| 22        | 26   | 52   |
| 23        | 48   | 25   |
| 24        | 26   | 42   |
| 25        | 55   | 13   |
| 26        | 68   | 52   |

|    |    |    |
|----|----|----|
| 27 | 52 | 78 |
| 28 | 89 | 46 |
| 29 | 23 | 89 |
| 30 | 72 | 36 |
| 31 | 58 | 51 |
| 32 | 80 | 36 |
| 33 | 39 | 17 |
| 34 | 50 | 38 |
| 35 | 48 | 46 |
| 36 | 75 | 48 |
| 37 | 58 | 69 |
| 38 | 49 | 31 |
| 39 | 32 | 35 |
| 40 | 43 | 46 |
| 41 | 65 | 87 |
| 42 | 38 | 57 |
| 43 | 32 | 59 |
| 44 | 19 | 65 |
| 45 | 31 | 25 |
| 46 | 71 | 54 |
| 47 | 56 | 51 |
| 48 | 36 | 53 |
| 49 | 46 | 54 |
| 50 | 65 | 74 |
| 51 | 52 | 70 |
| 52 | 27 | 40 |
| 53 | 35 | 51 |
| 54 | 33 | 60 |
| 55 | 26 | 49 |
| 56 | 18 | 42 |
| 57 | 54 | 21 |
| 58 | 26 | 16 |

|          |                    |                    |
|----------|--------------------|--------------------|
| 59       | 61                 | 34                 |
| 60       | 45                 | 32                 |
| 61       | 88                 | 32                 |
| 62       | 59                 | 32                 |
| 63       | 28                 | 48                 |
| 64       | 27                 | 84                 |
| 65       | 84                 | 85                 |
| 66       | 46                 | 81                 |
| 67       | 25                 | 82                 |
| 68       | 54                 | 83                 |
| 69       | 55                 | 45                 |
| 70       | 67                 | 54                 |
| $N_1=70$ | $\bar{X}_1= 54.13$ | $\bar{X}_2= 47.35$ |
| $N_1=70$ | $S_1 = 17.64$      | $S_2 = 19.30$      |

Where, Group I = students taught by trained teachers.

Group II =students taught by untrained teachers

$\bar{X}_1$  = Mean Score of the students from group I.

$\bar{X}_2$  = Mean Score of the students from group II.

$S_1$ = S.D. of the mark of group I.

$S_2$  = S.D. of the mark of group II.

## Appendix –B

### Statistical Formulas Used for Analysis

$$\text{Mean}(\bar{X}) = \frac{\sum x}{N}$$

$$\text{Standard Deviation (S)} = \sqrt{\frac{\sum(x-\bar{x})^2}{N}}$$

Where,

X= Score obtained by students

N= Number of students

Z-test is to determine the significance difference between two means.

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{N_1} + \frac{s_2^2}{N_2}}}$$

Where,

$\bar{X}_1$  = Mean Score of the students from group I.

$\bar{X}_2$  = Mean Score of the students from group II.

$S_1$  = S.D. of the mark of group I.

$S_2$  = S.D. of the mark of group II.

$N_1$  = No. of students in group I.

$N_2$  = No. of students in group II.



### Appendix –C

#### CLASSROOM OBSERVATION FORM

Name of the school: .....

Address of the school:.....

Name of the teacher: .....

Qualification/training duration: ..... Teaching experience: .....Class:

..... Subject: ..... Topic: .....

Date: ..... Period: ..... Time: .....

|                                  | S.N | Topic                                   | V | G | G | S | P | B | R |
|----------------------------------|-----|---|---|---|---|---|---|---|---|
| Appreance<br>in the<br>classroom | 1   | Cleanliness                             |   |   |   |   |   |   |   |
|                                  | 2   | Attractive physical personality         |   |   |   |   |   |   |   |
|                                  | 3   | Good health                             |   |   |   |   |   |   |   |
|                                  | 4   | Sweet voice                             |   |   |   |   |   |   |   |
|                                  | 5   | Simplicity                              |   |   |   |   |   |   |   |
|                                  | 6   | Pleasing                                |   |   |   |   |   |   |   |
|                                  | 7   | Self-confidence                         |   |   |   |   |   |   |   |
|                                  | 8   | Punctually                              |   |   |   |   |   |   |   |
|                                  | 9   | Helpful                                 |   |   |   |   |   |   |   |
|                                  | 10  | Respect                                 |   |   |   |   |   |   |   |
| Initiation of                    | 11  | Preparation of the daily lesson<br>plan |   |   |   |   |   |   |   |
|                                  | 12  | Motivation                              |   |   |   |   |   |   |   |
|                                  | 13  | Classroom management                    |   |   |   |   |   |   |   |
|                                  | 14  | Warm up                                 |   |   |   |   |   |   |   |

|                             |    |  |  |  |  |  |  |  |
|-----------------------------|----|--|--|--|--|--|--|--|
| the lesson                  | 15 | Readiness of the students for learning       |  |  |  |  |  |  |
|                             | 16 | Clarity of the objectives of the lesson      |  |  |  |  |  |  |
|                             | 17 | Recap  |  |  |  |  |  |  |
|                             | 18 | Starting of the lesson                       |  |  |  |  |  |  |
|                             | 19 | Sequence and series                          |  |  |  |  |  |  |
| Subject matter              | 20 | Dynamic                                      |  |  |  |  |  |  |
|                             | 21 | Based on curriculum                          |  |  |  |  |  |  |
|                             | 22 | Relevant to textbook                         |  |  |  |  |  |  |
|                             | 23 | Coverage of subject matter                   |  |  |  |  |  |  |
|                             | 24 | Based on teacher guide                       |  |  |  |  |  |  |
|                             | 25 | Relevant to the student's level and interest |  |  |  |  |  |  |
| Subject matter and sequence | 26 | Command over subject matter                  |  |  |  |  |  |  |
|                             | 27 | Appropriate illustration                     |  |  |  |  |  |  |
|                             | 28 | Organization of subject matter               |  |  |  |  |  |  |
|                             | 29 | Indication of important point of the lesson  |  |  |  |  |  |  |
|                             | 30 | Hidden curriculum                            |  |  |  |  |  |  |
| Language                    | 31 | Language structure                           |  |  |  |  |  |  |
|                             | 32 | Clarity                                      |  |  |  |  |  |  |
|                             | 33 | Fluency of language                          |  |  |  |  |  |  |
|                             | 34 | Appropriate voice                            |  |  |  |  |  |  |

|                         |    |  |  |  |  |  |  |  |
|-------------------------|----|--|--|--|--|--|--|--|
| Instructional materials | 35 | Use of low cost and no cost materials          |  |  |  |  |  |  |
|                         | 36 | Local materials                                |  |  |  |  |  |  |
|                         | 37 | Use of white board                             |  |  |  |  |  |  |
|                         | 38 | Use of extra materials                         |  |  |  |  |  |  |
|                         | 39 | Appropriate size of materials                  |  |  |  |  |  |  |
|                         | 40 | Proper use materials                           |  |  |  |  |  |  |
|                         | 41 | Use of multimedia materials                    |  |  |  |  |  |  |
|                         | 42 | Math lab                                       |  |  |  |  |  |  |
| Student's participation | 43 | Discussion on the subject matter               |  |  |  |  |  |  |
|                         | 44 | Experiment                                     |  |  |  |  |  |  |
|                         | 45 | Follow direction of the teachers               |  |  |  |  |  |  |
|                         | 46 | Participate on project work                    |  |  |  |  |  |  |
|                         | 47 | Student's regularity                           |  |  |  |  |  |  |
|                         | 48 | Homework and class work                        |  |  |  |  |  |  |
| Teacher's activities    | 49 | Justification of students views and confusions |  |  |  |  |  |  |
|                         | 50 | Style or arts of problem solving               |  |  |  |  |  |  |
|                         | 51 | Interaction with students                      |  |  |  |  |  |  |
|                         | 52 | Use of appropriate methods and materials       |  |  |  |  |  |  |
|                         | 53 | Use of science and technology                  |  |  |  |  |  |  |
| Closing of              | 54 | Continue Assessment                            |  |  |  |  |  |  |

|                       |    |                         |  |  |  |  |  |  |
|-----------------------|----|-------------------------|--|--|--|--|--|--|
| the lesson            |    | procedure               |  |  |  |  |  |  |
|                       | 55 | Evaluation              |  |  |  |  |  |  |
|                       | 56 | Guidance and cancelling |  |  |  |  |  |  |
|                       | 57 | Feedback                |  |  |  |  |  |  |
|                       | 58 | Homework                |  |  |  |  |  |  |
| If any more behaviors |    |                         |  |  |  |  |  |  |

VG = Very Good

G = Good

S = Satisfactory

P = Poor

B = Bad

R = Remark

.....

Signature of Observer

## Appendix-D

### TEACHER QUESTIONNAIRE

Teacher's name: .....

Address: .....

Sex: .....

Year of service: .....

School's name: .....

#### **Directions for Teachers:**

Dear teachers take it easy and be comfortable and relaxed to answer the following questions honestly and frankly to the best of your ability. It is not the intention of the questionnaire to tiptoe into your professional pluses and minuses. The secrecy of responses is fully guaranteed. Your identity will not be included or mentioned anywhere in the study. It is purely the research study that the researcher has undertaken as requirement to complete the Master's Thesis.

Give a short history about your academic background and training. (Nature and duration of training, places etc.)

.....  
 .....

| SN                        | Statements                            | SA | A | U | DA | SDA |
|---------------------------|---------------------------------------|----|---|---|----|-----|
| <b>Trainee Characters</b> |                                       |    |   |   |    |     |
| 1                         | I am happy because I am a teacher.    |    |   |   |    |     |
| 2                         | Teaching is an art.                   |    |   |   |    |     |
| 3                         | Teaching is a responsible profession. |    |   |   |    |     |

|                        |  |  |  |  |  |  |
|------------------------|--|--|--|--|--|--|
| 4                      | Teaching is psychological work.  |  |  |  |  |  |
| 5                      | Teacher can determine the future of nation.                                    |  |  |  |  |  |
| 6                      | Teaching profession is better than other profession.                           |  |  |  |  |  |
| 7                      | Teachers are respected from the society.                                       |  |  |  |  |  |
| 8                      | Teachers should play the role of educational leader.                           |  |  |  |  |  |
| 9                      | Teachers should always aspire to develop good relations with his/her students. |  |  |  |  |  |
| 10                     | Discipline problem is one greatest problem of the teachers                     |  |  |  |  |  |
| 12                     | Teaching profession is responsible in school as well as other places.          |  |  |  |  |  |
| 13                     | Teacher is an artist.  |  |  |  |  |  |
| <b>Training Design</b> |  |  |  |  |  |  |
| 14                     | I always make lesson plan.   |  |  |  |  |  |
|                        | IF NOT (because):  |  |  |  |  |  |
|                        | i. It is not necessary.  |  |  |  |  |  |
|                        | ii. Because of heavy load.   |  |  |  |  |  |
|                        | iii. I have not skill of this type.  |  |  |  |  |  |
|                        | iv. It is not needed for teaching.   |  |  |  |  |  |
|                        | v. Other reasons .....   |  |  |  |  |  |
| 15                     | There are different subjects among them, I enjoy teaching mathematics.         |  |  |  |  |  |

|    |  |  |  |  |  |  |
|----|--|--|--|--|--|--|
| 16 | Teachers should be familiar with the aim and objectives of the lower secondary level.                                      |  |  |  |  |  |
| 17 | Teachers should be well acquainted with the description of the objectives of mathematics program at lower secondary level. |  |  |  |  |  |
| 18 | I am well reached with the principles and theories involved in the teaching of mathematics.                                |  |  |  |  |  |
| 19 | My knowledge about planning, teaching materials, teaching methods and assessment is good enough.                           |  |  |  |  |  |
| 20 | I make different educational plan like annual plan, unit plan, and lesson plan.  |  |  |  |  |  |
|    | If “yes”, how do you make plans?<br>.....  |  |  |  |  |  |
|    | If “not”, why? .....   |  |  |  |  |  |
| 21 | I always select low cost and no cost materials as well local materials.  |  |  |  |  |  |
| 22 | I make and use teaching materials frequently to motivate the students to make mathematics more meaningful.                 |  |  |  |  |  |
|    | If’ not “at all because  |  |  |  |  |  |
|    | i. The materials are not easily available.   |  |  |  |  |  |
|    | ii. I don’t get encouragement and suggestions to make and use  |  |  |  |  |  |

|                         |   |  |  |  |  |  |
|-------------------------|---|--|--|--|--|--|
|                         | materials.  |  |  |  |  |  |
| 23                      | I believe that the use of materials enhances mathematics learning.  |  |  |  |  |  |
| <b>Work Environment</b> |   |  |  |  |  |  |
|                         | I believe that motivation is essential for teaching mathematics.  |  |  |  |  |  |
|                         | If “yes”, why? because  |  |  |  |  |  |
| 24                      | i. It is necessary for teaching.  |  |  |  |  |  |
|                         | ii. It develops interest of the students to learn mathematics.  |  |  |  |  |  |
|                         | iii. Without motivation teaching becomes extremely difficult.   |  |  |  |  |  |
| 25                      | I am cognizant with the technique of motivation.  |  |  |  |  |  |
| 26                      | I believe in teaching mathematics by involving students in discussion, project work, question answer and problem solving.   |  |  |  |  |  |
| 27                      | Students are like a computer as a machine where facts and information are stored to get later.  |  |  |  |  |  |
| 28                      | Students should be encouraged to learn and discover mathematical entities like laws, principles, theories and concepts by themselves rather than by taught and explained by the teachers. |  |  |  |  |  |



|    |   |  |  |  |  |  |
|----|---|--|--|--|--|--|
| 29 | I love children and enjoy with them while teaching.                                     |  |  |  |  |  |
| 30 | Do you need knowledge of different approaches to teach mathematics?                     |  |  |  |  |  |
| 31 | Formative evaluation or continue assessment system is necessary for teaching.           |  |  |  |  |  |
| 32 | Teacher should do evaluation day by day.  |  |  |  |  |  |
| 33 | Children are very difficult to deal with.   |  |  |  |  |  |
| 34 | Teachers should make the students to learn mathematics by the help of memorization.     |  |  |  |  |  |
| 35 | I have knowledge of child growth and psychology.  |  |  |  |  |  |
| 36 | Students should have got the knowledge of process and product of mathematical contents. |  |  |  |  |  |
| 37 | Students can learn best if they are punished regularly for learning satisfactorily.     |  |  |  |  |  |

Where,

SA-strongly agree, A-agree, U-undecided, D-disagree, SDA-strongly disagree.