

Chapter I

INTRODUCTION

The introductory part of this research consists of background, statements of the problem, objectives of the study, research questions, significance of the study, delimitations of the study and operational definitions of the key terms.

Background of the Study

Mathematics is considered to be the backbone of the community development which is also called the mirror of civilization. The origin of mathematics is same as the origin of human kind. Mathematics has led to the development of various subjects, vocations and other technologies. Today, mathematics is used throughout science, engineering, medicine and the social science. Applied mathematics, the branch of mathematics concerned with application of mathematical knowledge to other fields, inspires and makes the use of new mathematical discoveries and sometimes leads to the development of entirely new disciplines. Numerology is considered as application in that it holds a mystical view of numbers. Mathematicians are also engaged in mathematical examinations and mathematics for its own sake, without having any application in mind, although practical applications for what began as pure mathematics are often discovered later.

According to Eves (1990), in the ancient period, mathematics had originated primarily as a practical science to assist in agricultural and engineering pursuits. In seventeenth century, science of dynamics, field of pure geometry, modern analytical geometry, modern number theory, theory of probability was founded. Pierce, one of the well-known American mathematicians said that mathematics is the science that draws necessary conclusions. Nowadays, mathematics and mathematics education have separate academic disciplines. The mathematics is always involved in developing different theories and wants to abstract them to other disciplines and fields. But,

mathematics education explains about the application of theory in every aspect of human being. Going together both play a very important role in building up modern civilization by perfecting all sciences.

In Nepal, formal education was started with the opening of Durbar school in 1910 B.S. The contents of mathematics were not different than that of the contents offered in British system of education. Arithmetic, algebra, and geometry comprised the compulsory mathematics course carrying 100 marks as a full paper. With the dawn of democracy in Nepal in 1950 A.D., the gate of education got opened. There was rush for education all over the country. The National Education Planning Commission (NEPC) was constituted in 1954 A.D. and special emphasis was given to arithmetic aiming to tackle domestic accounts. Mathematics curriculum was made more scientific after the implementation of the National Education System Plan (1971-1976). Mathematics was made compulsory at all level of school education where a paper of 200 full marks was allocated for primary school mathematics and it was 30% of whole subject of teaching workload. In lower secondary and secondary level mathematics, it was given 20% and 12% of total time with 150 and 100 full marks respectively. Also, at the secondary level, the paper of mathematics was introduced with 100 full marks as an optional subject.

Teacher Training

Training means the process of learning the skills that we need to do a particular job. Without having proper training, a single teacher cannot teach his/her students effectively. Hence training for teachers is inevitable and competency in teaching results from it. Training is the process of behaviour shaping because training makes a teacher perfect in his/her classroom teaching. There is the distinction between training and education. Training is related to skill and education is for decision making and making predictions. Training helps teacher to identify the students' interests and knowing their problems and difficulties. Teacher training is pre-requisite for bringing quality in

education. It provides opportunities for teachers to acquire theoretical knowledge as well as practical knowledge of the professional functions and responsibilities in teaching. He/she should mould the students' aesthetic and intellectual personality. Teaching is an art and teacher is an artist. A trained teacher can influence the students by his/her gesture just as artist shows his/her art on the dais. Thus, teachers' role is sensitive and dispensable for effective and quality teaching.

Teacher Training in the Context of Nepal

Teaching is a professional activity that requires specialized knowledge acquired through training and experience (Pollard and Bourne, 2010). Training is the means of maintaining standards and of ensuring that those who are introduced for the first time in existing work and practices are able to maintain those standards. Pedagogical skills can be improved by emphasizing training courses that develop the teacher's ability about the contents of instruction and related theory to practice.

The first teacher training institution was established in Nepal in 1974 A.D. to train teachers for basic schools. Nepal has moved through a myriad of teacher education system over the years since the dawn of democracy in 1950 A.D. However the training program was discontinued to function after the recommendations of National Education Planning Commission (NESP) for the establishment of College of Education in 1956 A.D. to provide two years' teacher education programmes to the perspective lower secondary teachers of Nepal. Currently, Secondary Education Development Project (SEDP) is running ten months' teacher training program for secondary level teachers. In order to run these centres and colleges, the teachers were trained either in the USA or in Philippines.

At the beginning of training for the teachers, it started from the establishment of school. It was established for the teaching profession in the form of College of Education in 1956. Nowadays, it is known as the Faculty of Education with its separate

identity in higher education. Training institution such as National Centre for Educational Development (NCED) directly works under the Ministry of Education. These training programmes were different in terms of duration, management, modes of operations, evaluation of trainees etc. On the other hand, different types of school level trainings are being launched by NCED through its training centres located at different parts of the country.

Teacher education is one of the major components of Secondary Education Support Programmers (SESP). The SESP document, in its policy, says that in-service training will be provided on the basis of competencies of the teachers required for the delivery of effective teaching learning activities in the classrooms. This ten months' lower secondary mathematics teacher training curriculum consists of three modules. The first and third modules both consist of two segments training centre based training followed by school based training. Second module is based on distance learning. The curriculum has been designed specially to address the needs of lower secondary mathematics teachers. The NCED provides training opportunities to the permanent teachers of all levels of school education for ten months by building extensive training networks among potential training providers such as ETCS (former PTTCS, SEDUS), private training institutions and FOE until the existing mass of untrained teachers remains in the system.

Since 1987 A.D., the Faculty of Education under T.U. was started to provide teacher training for lower secondary level. In-service training in science and mathematics was run by Science Education Development Project (SEDP) under Ministry of Education since 1993 A.D. with the assistance of a loan from the Asian Development Bank (ADB) and grant from the Overseas Development Administration (ODA). The long-term and the short-term professional training programmes for lower secondary and secondary level teachers organized by T.U. were however not adequate to

fulfill the challenges of providing trainings to all the untrained teachers who were on the job as well as to those who were perspective teachers.

Limited studies have been conducted to study the effectiveness of teacher training. These studies are just opinion of stakeholders, community leaders, teachers, headmasters, educational administrators and sometimes of the students. Almost all the studies on teacher training have however failed to demonstrate any association between teacher training and children learning achievement in mathematics in lower secondary level and have not provide any theoretical contribution towards building a theory based curriculum for lower secondary teacher training. So the effectiveness and quality of training courses have been subjects of concern. These concerns, as well as my desire to understand the effectiveness of the 10-months' in-service training courses prompted to undertake this study.

All the previous studies on transfer of teacher training that contribute to our knowledge and insights in this area of training and development were limited to the researching effects of training. None of those studies reflected the culture and context of Nepalese schools. Thus the factors that hinder the mathematics teachers to transfer the training skills in real classroom situations remained unexplored are of big concern in the context of Nepal.

Statements of the Problem

According to the previous results of school leaving examination, mathematics has become a great challenge for the students of this level because most of the students fail in mathematics and it has created a big problem for teachers, school administrators, curriculum developers, parents and other related bodies. Millions of rupees have been spent in the areas of teacher training during the past decades in Nepal. It is believed that there are qualified and trained teachers in community schools but the result seems poor rather than in private schools.

The study was mainly concerned with the study of effectiveness of 10 months' in-service teacher training programme on teaching-learning of mathematics at secondary level in Morang District. It had included the comparison of the students' achievements taught by trained and untrained teachers. This study was also helpful to find out the barriers of training transfer in the actual classroom of that district.

This study was intended to answer the following research questions:

-) Does the mathematics achievement of secondary level students taught by trained teachers differ from that the achievement of students taught by untrained teachers?
-) How is the current status of transfer of teacher training in the actual classroom teachings?

Objectives of the Study

The main objective of this study was to explore the effectiveness of 10 months' in-service teacher training programmes for secondary level teachers in Morang District. More specifically, this study was intended to accomplish the following objectives:

-) To analyze the mathematics achievements of secondary level students taught by trained and untrained teachers.
-) To explore the current status of transfer of teacher training in mathematics classrooms.

Significance of the Study

Mathematics has become one of the most essential parts of school curriculum and human life. The value of mathematics has increased day by day in this modern era because there is no any area which doesn't need the support and application of

mathematics. There are several aspects in the world which need the help of mathematics to interpret and generalize to the people.

In our context, mathematics is taught from primary level to secondary level as a compulsory subject. Thus, there should be special attention and concentration on mathematics from the very beginning of school education. Besides being compulsory at all levels, an additional 200 marks' mathematics has been included in grades IX and X as optional. In general, this study could be a milestone to know the current situation of school level mathematics learning and could be helpful to find out the measures to overcome the threatening problem of failure in school mathematics.

The study is significant for the following reasons:

-) The present study helps to find out the situation of classroom performances of trained and untrained mathematics teachers of secondary level in Morang District.
-) This study can act as a bridge between the teacher training programme and the classroom implementation.
-) The study helps to analyze the teacher training curricula, teaching strategies, objectives and training performances as well as the proper follow up by the teachers in the schools.
-) This study directs the resource persons, mathematics teachers, trainers and district education office.
-) This study finds out the current situation of teacher training transfer inside the mathematics classrooms and the strengths and weaknesses of trained and untrained teachers both.
-) This study directs the education policy makers and curriculum framers to select the effective teaching approaches for effective classroom performances for mathematics teachers.

Delimitations of the Study

Delimitations address how a study was narrowed in scope; that is, how it was bounded. This is the place to explain things that the researcher is not doing or not involving them in his study. The reason for doing this is to make the study more focused or specified in a limited area. This helps to get more accurate result so that it can be generalized easily and effectively in the targeted area/wider area. On the other hand, the researcher has to complete his study in a certain period with a small economic investment and he has to utilize the locally available instruments/materials. Therefore, boundaries or delimitations for this research study are stated in this section.

The following points were delimitations of this study:

-) The study was delimited to public secondary schools in Morang district.
-) This study included only ninth grade pupils taught by trained and untrained teachers.
-) This study examined only scores of students obtained from annual examination of grade IX.
-) This study was not concerned with the availability of textbooks, classroom situations, ventilation, lights etc. inside the classroom.
-) Secondary data was used to identify the achievement scores.

Operational Definitions of the Key Terms

Some operational Definitions of the related terms are defined here briefly:

Secondary Level Mathematics Teacher

Teachers who teach mathematics at classes IX and X are considered as the secondary level mathematics teacher.

Achievement

In this study, achievement refers to the scores obtained by the students in the final examinations.

Public Schools

Public schools are those schools which are benefited and granted by government for the financial purposes and other purposes.

Private Schools:

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.

Training

A planned and systematic effort to develop knowledge/skills/attitudes through learning experience to achieve effective performance in teaching mathematics at secondary level is defined as training.

Training Transfer

Training transfer refers to the ability of a trainee to apply the behaviour, knowledge and skills acquired in one learning situation to another.

Trained Teachers

The teachers who have passed one/two/three years B.Ed. or who have received 10 months' in-service training after completion of his/her Bachelor's degree from humanities, science, management and other faculties except education.

Untrained Teachers

The teachers who have not received above mentioned training and have passed their bachelor's degree from other faculties like science, arts and commerce.

Training Skills

Skills related to the use of text books, adoption of student-centred approaches, preparation of yearly plan, use of blackboards, cutting out the pictures, using the flash cards, using real and locally available objects as instructional materials, use of students attendance boards, appropriate testing and evaluation skills etc.

Effective Teaching

A classroom teaching which produces the result that is wanted or intended is generally known as effective teaching. In other words, effectiveness is concerned with increment on students' achievements in quantity and quality both.

Teaching Performance

Teaching performance is synonymous with behaviour of the teacher inside the classroom. It is something that teachers actually do and can be observed. It includes only those actions or behaviours that are relevant to the curricular goals and that can be scaled (measured) in terms of each individual's proficiency.

Retention

Retention is a memory term, and is generally the ability to continue doing something after a period of not engaging in the activity. The endurance of behaviours which have been learned or acquired when the behaviour is not being utilized, signified by being able to recall, relearn, recognize, or reproduce the behaviour is known as retention.

Descriptive Statistics/ Analysis

Descriptive statistics/analysis is the discipline/process of quantitatively describing the main features of a collection of information or the quantitative description itself. Some measures that are commonly used to describe the data are mean, median, mode, standard deviation etc.

Chapter II

REVIEW OF RELATED LITERATURE AND CONCEPTUAL FRAMEWORK

Review of Related Literature

The review of related literature deals with the theories of research studies, which have been conducted earlier. It provides the researcher clear map to move ahead and to find the destination easily. Literature review helps 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 is to review literature related to the topic of this study. The researcher conducted this research with the literature review of national as well as international researches. Besides these, some theories regarding teacher training and transfer of training have also been studied while reviewing the literature, recent books, articles, journals and internets were used. Review of literature is not an exhaustive review of all the literature in the field, but refers to researches undertaken in the areas of teacher training and transfer of training in the classroom situation. Finally, the transfer of teacher training is reviewed, again with special concern placed on trained teachers' classrooms in the context of Nepal. Some of the literatures related to this study ate listed below:

Maskey (1975) conducted a comparative study on “Mathematics Achievements of Primary School Students under Different Class Sizes”. This study was made to investigate the effect of the class size in the achievement of students in mathematics at 3rd grade of primary schools in Birgunj. The instrument adopted in this study was an achievement test paper. The procedure used in the collection of data was the recording of score of each student after administering an achievement test in mathematics at the end of the session. All the schools included in the sample were divided into three categories viz. large class having 40 or more students, medium class having 15 to 39

students and small class size having 14 or fewer students. Under these categories, two schools came under large class size, three schools came under medium class size and four schools came under small class size. Finally, he concluded that the mean difference between the achievements of schools belonging to different class sizes were found to be significant and this was further strengthened by the fact that the mean difference between the achievements of schools belonging to the same class sizes was significant.

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 were in control group and 30 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 construction, both groups were administered 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 mean achievements non-tested by statistical method. Lastly, he concluded 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.

Shrestha (1990) did a research on the topic “A Study on the Performance and Attitude of Trained and Untrained Teachers of Nepal” and concluded that trained teachers do better job in teaching and cultivate a more positive attitude towards teaching. The existence of one or several teachers has been found to be instrumental, in many ways making modern influences among the staffs and the school activities.

Roebuck and Aspy (1994), did a research on the topic “Comparative Achievements of the Students Taught by Trained and Untrained Teachers” and reported that achievements in mathematics of grades 4 to 6 and 6 to 9 students taught by trained teachers is more significant than the students’ achievements taught by untrained teachers. But there are parallel achievements in higher education in mathematics.

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 schools. The method of sample selection 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.

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 are also not using their training capabilities in classroom instructions and teaching techniques of both private and public primary schools were not much different. Also, in private schools, the students scored the highest marks in English.

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 of training on the instruction of transformation geometry. The study was conducted on Sindhupalchowk District for the 35 sample secondary level mathematics teachers. The researcher

concluded that teachers from 3 years B.Ed. programme were better than one year B.Ed. and B. Sc. while teaching the concept of transformation.

CERID (2003) a study report submitted to NCED with the objectives to identify the professional activities carried out by the traditional teachers in real classroom situation and find out the barriers that hinder teachers from translating the acquired skills into the classroom practices. There were 305 teachers, 36 head teachers and 16 resource persons selected from 109 schools of three districts. The tools for this study were classroom observation checklist accomplished by interview, questionnaire for the trained teachers and focused group discussion with school managing committee members. It concluded that one third of the teachers were found to have prepared plans for the lessons and the training package was found not to have been appropriately equipped the teachers with the skills of preparing and using teaching materials. About 29% of the teachers were found using group work in classrooms and only a very small number of teachers were found using blackboard appropriately and interaction among the students was found to be negligible.

Thapaliya (2004) "Teachers Education" stated that the training programmes are mainly designed for three basic purposes: firstly, it aims at solving immediate problems in the work situation, secondly, it is undertaken as a new job responsibility, and finally, in the broader sense, a training programme aims at developing human capability to deal with the problems in the relevant area that is over and above the immediate practical problems.

Paudel (2006) did his research work entitled "A Comparative Study on Mathematics Achievements of Secondary Level Students Taught by Trained and Untrained Teachers". To collect the data, firstly, a set of achievement test questions was developed and administered on 168(84 boys & 84 girls) students of grade 9 from 12 schools of Kathmandu Valley. Secondly, two sets of opinionnaires were developed

which were related to the problems faced by trained and untrained teachers and their students respectively. The researcher found that the training is necessary to all mathematics teachers for best achievements in that subject. Also, it was found that there was significant difference between the achievements of boys and girls students taught by trained and untrained teachers.

Thapa (2007) studied on "Transfer of Teacher Training skills in classroom situation". The design of the study was qualitative. This study was designed to find out the current status of transfer of teacher training skills in classrooms by trained teachers. In this study, transfer of training was analyzed through observation of trained teachers' classroom activities. Interview with trained teachers and head teachers were also conducted. The inhibiting factors regarding transfer of teacher training were analyzed through interview with trained teachers and head teachers as well as through overall observation of school climate and trained teachers' behaviour and activities. It concluded that the performances of trained teachers were better than the performances of untrained teachers. Although the performances of trained teachers were better than that of untrained teachers, the level of teachers training was not up to the satisfactory level.

Basnet (2008), made a study on "Effectiveness of four weeks in-service Teacher Training for Teaching Mathematics at Secondary Level." The design of this study was survey and in order to collect the data, two sets of questionnaires; one for partially trained teachers and other for their headmasters and classroom observation were developed. For quantitative data, the result of mathematics in SLC 2062 was taken. The population constituted of all secondary level mathematics teachers of public schools who had taken ten months' in-service teacher training and whole students of grade X of public schools of Salyan District. Ten mathematics teachers of secondary level and their headmasters and 200 students were sample in this study. The sample was drawn purposively and z-test was applied to find out the result. The major finding of this study

was that the teaching is comparatively effective taught by trained teachers than untrained but the result of the students taught by trained teachers is not satisfactory.

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 to 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 than the achievement of students taught without problem solving method.

Lamichhane (2010) did his research on the topic "The Effect of Teacher Training in Mathematics Achievement at Secondary Level" in Tanahu 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 ten 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.

Subedi (2012) conducted a research entitled "Effectiveness of Teacher Training Programme on Students' Achievements and Teaching Learning Activities" to find out the effectiveness of teacher training programmes on secondary level mathematics students' achievements and also to explore its impact on secondary level mathematics teachers' teaching learning activities. The research was of survey type which involved 30 secondary level mathematics teachers as sample through stratified random sampling,

in which 15 teachers were trained and 15 untrained. Four types of research tools viz. achievement test, trained and untrained teachers' interview, head teachers' interview and classroom observation form were used to collect data from the sample teachers and students. Subedi concluded that the mean achievement of students taught by trained teachers is higher than the mean achievement of students taught by untrained teachers.

From all the above reviews of previously completed researches, the researcher can conclude that training is very much crucial process of supporting employees to bring effectiveness in their present or future work by making appropriate habits towards the job. It serves as a balancing factor between employees' capabilities and job requirements. Training creates a feeling of confidence in the mind of the employees. They may feel becoming efficient to complete the assigned job after training.

In the context of Morang district, there doesn't seem even a single research which has been conducted on status of training transfer in real classrooms. There is sufficient number of training programmes for mathematics teachers in this district, but it is seen that there is very less number of teachers who follow all the skills and techniques gained in trainings. Therefore, lack of sufficient researches and proper implementation, still there remain several problems concerning mathematics teaching and learning. Thus the researcher was interested and conducted a thesis focused on teacher training and its proper implementation.

Conceptual Framework

This section deals about the conceptual framework for the research. It deals about researcher's own concept to conduct the research in an original way. The topic of this research indicates that it is the study which examines the 'Transfer of Training' in secondary level mathematics teachers in Morang district. Transfer of training refers to the ability of a trainee to apply the behaviour, knowledge, and skills acquired in one learning situation to another. In other words, 'Transfer of Training' refers to the effect

that knowledge or abilities acquired in one area have on problem solving or knowledge acquisition in other areas.

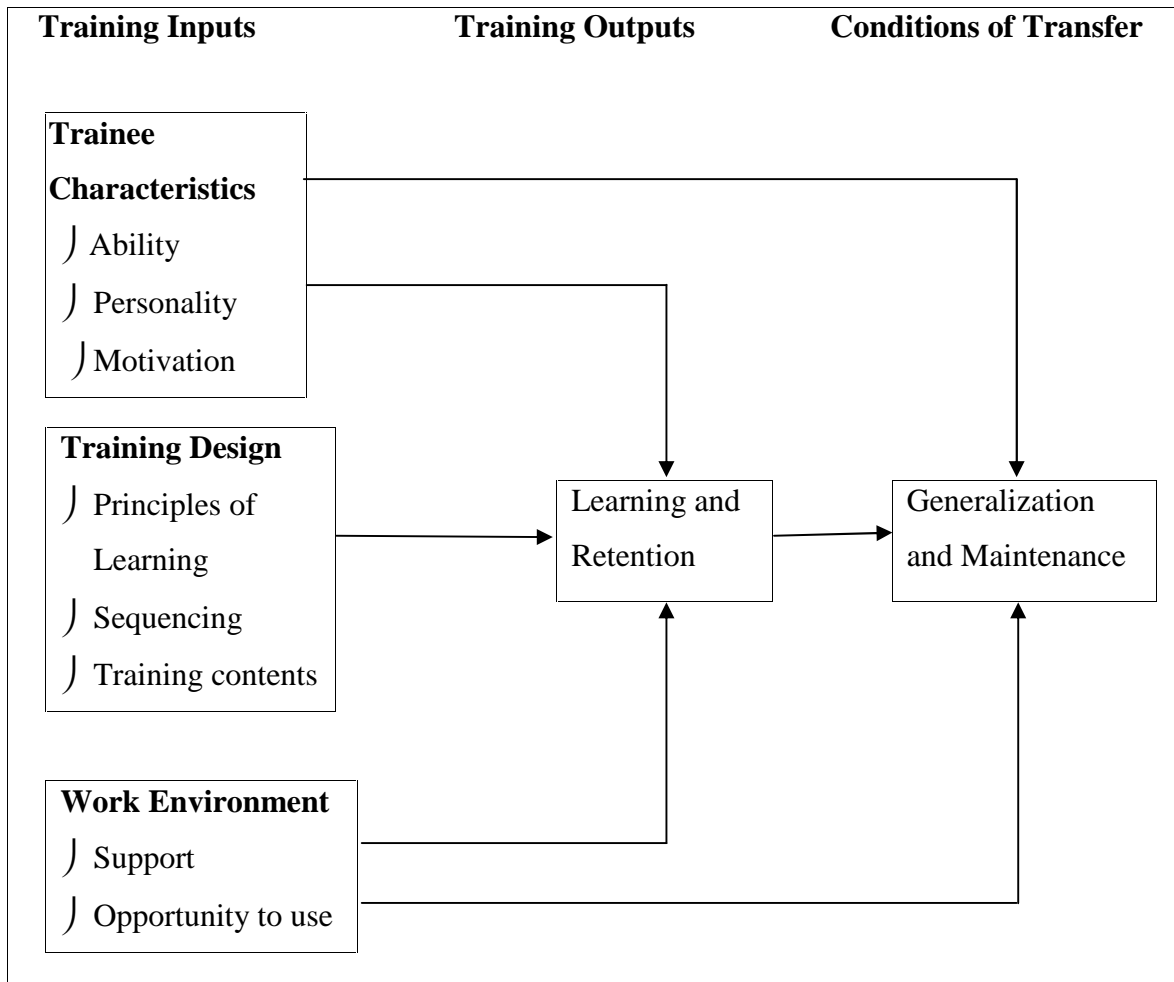
The framework of this research is based on the training transfer model of Baldwin and Ford. Baldwin and Ford's Transfer of Training Model (1988) is based on the idea that the transfer of training depends on training inputs that include trainees' characteristics, training design and work environment. However, an important point in the model is that the outcomes of training is impacted by trainees' characteristics and work environment in a direct manner, whereas the impact of training design depends on the levels of training outputs such as learning and retention. The transfer of Training Model has made a valuable contribution on the study of training transfer. The main benefit of the model in practical levels can be explained in a way that it allows framework for evaluating the impact of each individual input factor in training and identify and utilize the potentials for improving the impact of elements associated with each individual factor.

The components included within the three topics training inputs, training outputs and conditions of transfer are directly related to each other. For effective training input, trainee characteristics should be training oriented. Similarly, training design should be made suitable and also the work environment is needed to be appropriate. Therefore, good learning and retention is possible. When the learning and retention take place, generalization and maintenance is possible. On the basis of this fact, the researcher has made his questionnaire and checklist carefully to incorporate those components and to follow the direction shown by it. Components such as ability, personality, motivation etc. are addressed by preparation of lesson, creating learning environment, instructional skills etc. When drawing conclusion, the condition of generalization and maintenance was seen. Similarly, by the observation of classes of trained teachers, the status of

learning and retention was seen and ultimately it made possible to make decision about the status of training transfer.

The diagrammatic representation of conceptual framework is given below:

Baldwin and Ford's Training Transfer Model (1988)



Looking into the model, training inputs include trainee characteristics, training design, and work environment. Each of the three inputs given in the framework indicates their component elements. For instance, ability of trainee, personality and motivation form part of trainee characteristics. The second input, training design, shows principles of learning, sequencing and training contents. Last component of the inputs, work environment, refers to the availability of support and opportunity to use training. It is important to note that the training inputs have direct effect on the conditions of transfer,

whereas they also indirectly affect transfer of training with the help of training outputs, which in case of this model have been identified as learning and retention. The lines connecting various boxes show direction of relationship and their linkages. The framework of this model was basically used to describe the transfer process, the way it correlates with generalization and maintenance of training.

The conditions of transfer include both the generalization of knowledge and skills acquired in training to the job and maintenance of that learning over time on the job. Training outcomes include the knowledge, skills and affect acquired as a function of training and the retention of the training content. Since the transfer training model of Baldwin and Ford is very useful and widely used for different studies, so the researcher followed this model for this study. One main reason for following this model is that this model seems highly applicable for the studies focused on local situations like Morang district. On the other hand, the components given by Baldwin and Ford are also important to study about the teacher training transfer in the context of Nepalese schools. Thus, being based on this model the researcher completed his study and tried to incorporate all components or factors indicated by Baldwin and Ford in their model and followed the way shown by them.

The researcher chose the Baldwin and Ford's Training Transfer model for the study to follow because all the components indicated in the model are applicable and related to the researcher's study. The researcher found the components such as Trainee Characteristics, Training Design, and Work Environment directly related to the trainees and their characteristics in the local context like Morang District.

Chapter-III

METHODS AND PROCEDURES

This chapter deals with the methodologies which were adopted in this research. The chapter includes design of the study, population of the study, sampling procedures, data collection tools and techniques and data analysis procedures. The followings were the methodologies.

Design of the Study

To explore the performances of trained and untrained teachers in secondary level mathematics classrooms and to identify the impact of teacher training on those classes, the researcher followed survey research design which was quantitative and qualitative both in nature.

Survey research is a technique for social science research and educational research. 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. Researcher gathers data in a particular point of time especially to describe the nature of existing situation or to identify most standard one against the existing in survey research.

Survey research is a type of research which studies a large population by selecting sample in the condition of less possibility to study the whole population. This research is also carried out in educational sector to obtain a snapshot of condition on perception of classroom environment.

Population of the Study

A population is any group of individuals that has one or more characteristics in common and that are of interest to the researcher. This study was undertaken for the purpose of mathematics achievements of students taught by trained and untrained teachers. Thus, the population of this study was the entire secondary level mathematics

teachers of Morang district and also, all the students of grade nine of public schools of that district.

Sampling Procedure

A sample is a small proportion of the population that is selected for observation and analysis. In Morang district, there are 147 secondary level government schools. The researcher selected 50 secondary schools from the total schools in which 25 schools having trained mathematics teachers and 25 having untrained. Also, for the sample students, from total students studying in 50 sample schools, 140 students were selected on the basis of stratified random sampling method in which 70 students were taught by trained teachers and 70 were taught by untrained teachers separately.

Data Collection Tools and Techniques

Every study requires appropriate tools/instruments for data collection. In this study, the researcher used mark ledger/annual result of grade nine students of the academic year 2070 and observed the classes of sample teachers where checklist and questionnaire were used as instruments to collect the data.

Mark Ledger/Annual result of grade IX

This was a perfect tool for data collection to meet the objective 'to analyze the achievements of students taught by trained and untrained teachers'.

Checklist/Classroom Observation Form

Checklist is another effective tool to collect required information and data that the researcher had used for this study. The Checklist/Classroom Observation Form was intended mainly to find out the current status of training transfer in the actual classrooms after the 10 months' in-service training. The major aspects of observation were preparation for lesson, creating learning environment, commencing the lesson using different teaching methods, using instructional materials, providing feedbacks, instructional skills and concluding the lesson etc.

Questionnaire

At first, the researcher developed the tools by himself and discuss in the small group of experts and thesis guide to make them clear, concise and easy to use in the field. By receiving feedbacks from the experts, the tools were developed, improved, tested and finalized to use them in the actual field to collect required information and data. The checklist was also intended to give answer to the question 'how is the current status of training transfer in actual classroom teachings?' So the questionnaire was also used to find out the teachers' views about training transfer in teaching-learning of mathematics.

Reliability of the Tools

If the responses in the questionnaire are difficult to answer, the questionnaire must be consistent according to the reliability of the tools. A same type of questionnaire and classroom observation form was examined in different groups. The questionnaire consisting of 25 statements which was developed based on the parameters of the conceptual framework. Also, interview and classroom observation form was developed based on different variables that affect effectiveness of teaching skills of mathematics teachers under the guidance of the expert and supervisor. Cross match was adopted to maintain the reliability of the qualitative and quantitative data.

Validity of the Tools

Validity of the tools is the important characteristics of the questionnaire and classroom observation form. An instrument is valid if it measures what is supposed to measure. Validity depends on the amount and type of information to support the data interpretation of the researchers who wish to make concerning the data they obtained. Validity of the tools is determined by content of the research theory. The researcher had also tried to ensure the internal validity by observing the same phenomenon repeatedly

by clarifying these biases and by the help of expert and supervisor. Hence validity of the tools is determined by the content of the research theory.

Data Collection Procedure

The researcher visited the Morang district education office to get the record of secondary level schools and mathematics teachers teaching there and also requested district education officer to write a request letter for the help needed to the researcher from the school administration. For the collection of data, the researcher visited each of the sample schools along with the checklist/observation form, questionnaire & the request letter. After explaining the purpose of the visit and requesting for the kind co-operations, the researcher distributed the questionnaires to the teachers and respective head teachers as well to collect their views and behaviours of mathematics teachers which were indicated as shown in the questionnaire. (See Appendix B & Appendix C) The researcher asked for permission to each of the sample teachers to observe their classes and to note down the characteristics or behaviours seen during the teaching learning activities. After getting permissions, the researcher collected the required information through check list. Also, the researcher collected the result of students of grade IX in the final examination of year 2070 to compare the mathematics achievements of students taught by trained and untrained teachers.

Data Analysis and Interpretation Procedure

When the collection of information about students' annual achievements, the data collection through the observation of teachers' classes and questionnaires were completed, they were tabulated in order to make information processing easier and to calculate them using mathematical formulas. Keeping the objectives of the study in priority, the collected information was categorized into two groups so that it became easy to interpret.

The statistical device two tailed z-test was applied at 0.05% level of significance. This indicates that if the z-value at 5% level of significance for every academic year is equal or more than 1.96 then there is significant difference in the achievement of students taught by trained and untrained teachers.

The data collected through questionnaire and classroom observation form were tabulated first and the researcher calculated the mean weights of the responses given by the sample teachers. The weights 5, 4, 3, 2, 1 were assigned to the statements if the response is “strongly agree”, “agree”, “undecided” and “strongly disagree” respectively. Weights were assigned in reverse order i.e. 1 for “strongly agree” and 5 for “strongly disagree” in the case of negative statements. 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 index is greater than 3 then it is concluded that the statement contains its strong favour for the performance of the teacher. If the index measure is less than or equal to 3 then it is weak favour to the performance.

The researcher calculated the mean weight of the responses using the following formula:

$$\text{Weighted Mean} = \frac{\text{Total rank score of the statements}}{\text{Number of respondents in the sample}}$$

Each statement was studied in terms of whether the classroom performance of teachers was up the mark or not. If the calculated mean weight is greater than 3 then it is a favourable performance. On the other hand, if the mean weight is less than 3 then it is a less favourable performance.

Chapter-IV

Analysis and Interpretation

This chapter deals with the statistical analysis and interpretation of the data obtained from annual result of the school, questionnaire and classroom observation form. This includes the analysis and interpretation of mathematics achievement of the students of grade-IX taught by trained and untrained teachers. The collected data were tabulated and analyzed for the study of attainment of objectives and verification of the research problems as stated in the statements of the problem. Data were analyzed using mean, standard deviation, coefficient of variation, two tailed z-test at 0.05% level of significance.

It deals with statistical analysis and interpretation of the data obtained from the scores of 140 students (70 students taught by trained teachers and 70 by untrained teachers) of 50 sampled schools. These data were tabulated and analyzed using mean, standard deviation and Z-test. While analyzing data, focus was placed on transfer of training skills acquired by the trained teachers who were trained in 10 months' secondary level training packages and the barriers in transfer of training skills have also been analyzed and interpreted in this chapter.

Comparison of Achievements of Students Taught by Trained and Untrained Teachers

Achievements of students taught by trained and untrained teachers in terms of mean, standard deviation and Z-test scores is shown in the following table:

Table No.1: Statistics of students' mathematics achievement

S.N.	Group of Students	No of Students	Mean	S.D.	Z-test
1.	Taught by trained teachers	70	30.76	6.835	2.27
2.	Taught by untrained teachers	70	26.84	8.594	

The table-1 shows the mean scores of the students 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 teachers is 70. The mean scores of the students taught by trained and untrained teachers are respectively 30.76 and 26.84. That is, the difference between the mean score is 3.92. This shows that the mean score of the students taught by trained teachers is higher than the mean score of the students taught by untrained teachers.

Similarly, the standard deviation of the students taught by trained teachers is 6.835 whereas the standard deviation taught by untrained teachers is 8.594. This shows that the standard deviation taught by untrained teachers is higher than the standard deviation taught by trained teachers. Thus, we can conclude that there is uniformity on the obtained marks of the students taught by trained teachers than the untrained teachers. From the above table it is observed that calculated Z-value 2.27 is greater than tabulated Z-value 1.96 at 5% level of significance. Therefore, it is concluded that there is significance difference in the mean achievement 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.

Classroom Performances of Mathematics Teachers

Teacher teaches the students to perfect themselves by acquiring and increasing knowledge. Teaching is basically an art, a teacher as an artist can be very successful in his performance if he is equipped with certain skills of classroom teaching; there are certain but not fixed accepted process of classroom teaching. Some of the most important teaching skills are: skill of the introducing lesson, skills of using instructional materials, skills of using blackboard, skill of questioning, skill of reinforcement, skill of explanation, skill of illustration, skill of stimulate variation, skill of applying the

transfer of learning, skill of closing of the lesson etc. The knowledge of ages, stages, experience and few skill of teaching help teachers to teach mathematics effectively. It is assumed that most of the teachers cannot use teaching skills due to many reasons. The present study was to identify the classroom performances of secondary level mathematics teachers in Morang District.

Teachers' Beliefs and Attitudes/Trainee Characteristics

Teachers' beliefs and attitudes or trainee characteristics means the view, the attitudes or the characteristics of the mathematics teachers towards the training transfer of mathematics. Some attitudes, characteristics and data related to those aspects collected through questionnaire and classroom observation form are described below:

In response to the statement "*Thanks I am a teacher*", the mean weight of this statement is 4.36 and 86% of the total respondents are strongly agreed with this statement. This is the most positive statement for this study. It means the teachers are very proud of being involved in teaching profession.

In response to "*Teaching is a respectable job*", the mean weight of this statement is 3.88 and 80% of the total respondents are strongly agreed with this statement. This is also the most positive statement of the study. So by the interpretation of the collected data, the researcher drew the conclusion that teaching profession has made teachers respectable.

In response to "*I love children and enjoy working with them*", the mean weight of this statement is 4.08 and 70% of the total respondents are strongly agreed with this statement. This is the 3rd positive statement of the study. So from this interpretation, we can claim that there is collaborative environment between students and teachers.

Hence we conclude from above responses that the teachers are proud of themselves in being mathematics teachers. Among different fields of working, teaching mathematics seemed respectable one because many people feel pleasure in being

mathematics teacher and they are respected as the God. Teachers applied child-centred approaches to know the child psychology. 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 used abstract teaching materials to develop the level of understanding of the students. Lastly, the mathematics teachers are very worried about problems of discipline which should be improved timely to raise the mathematics performance and the transfer of mathematical skills acquired through trainings.

In response to "*I make daily lesson plans*", the mean weight of this statement is 2.24 and about 43% of the total respondents are disagreed to this statement. This is an unfavourable statement of this study. So the researcher concluded that most of the mathematics teachers do not make daily lesson plans for their mathematics lessons which are the current trend of our schools.

In response to "*I make and use materials frequently to motivate my students to learn mathematics meaningfully*", the mean weight of this statement is 2.32 with which very few teachers are agreed and most of the teachers are strongly disagreed. This is another unfavourable statement because 2.32 is less than the rule of thumb 3. So the researcher can say that there isn't proper use of materials to motivate the students towards the learning of mathematics.

In response to the statement "*Children learn best when pin-drop silence is maintained in the class along with strict discipline*", the mean weight of this statement is 2.24 which is an unfavourable statement of this study and the figure 2.24 is less than the rule of thumb 3. This is ineffective and shows a great problem of discipline in classrooms of mathematics.

Also, the researcher observed the classroom activities of mathematics teachers and found the actual status of the classroom management and other aspects which

directly affect the transfer of teacher training. Some important points are described below:

The mean weight of transfer his/her competency was 4.21 which is favourable to the transfer of training. Similarly the mean weight of interaction with students was 3.71 which mean there is a good interactive relation between students and teachers in mathematics classrooms.

Planning and Preparing the Lesson/Training Design

Planning and preparation is the basic part of the classroom delivery of instruction. It is the initial phase in the delivery of instruction. So, it is directly related to the planning of lesson and collection and preparation of instructional materials to make teaching more effective. Planning and preparation provide teachers with an idea of how to develop the key concepts and how to correlate them to actual life situation of students. So, a teacher needs to be prepared to enter into the classroom.

Through classroom observation, it was found that most of the trained teachers did not prepare any written plan for a lesson to be taught and only a few of the total observed teachers' performance in this aspect was good. Similarly, trained teachers were also interviewed to collect useful information about Planning and Preparation for lesson. While asking, "*Why didn't you use lesson plan?*" Trained Teacher (Surya) said, "*How can I make written lesson plan without having time? I have learnt some new knowledge and skills from training but how can I use those knowledge skills in the actual classroom situation?*" most of the teachers responded that they did not prepare annual and daily written lesson plan but they claim that they were mentally prepared for the lesson.

Large number of trained teachers was found not to have prepared instructional materials for lesson while observing their classes as a result the transfer of training in this regard is unsatisfying because the mean weight for the topic "Instructional materials" is 1.04 which is below the rule of thumb 3. But very few trained teachers'

performance in this aspect was found excellent and other remaining 1(4%) of the performance was found fair only, which means they prepared few instructional materials. In the informal discussion with trained teachers, it was also found that majority of the teachers did not pay attention to material preparation and their use. While asking “*Why didn’t you construct and use instructional materials?*” to the trained teachers, Indra said, “*I had to teach full period in a day and the school fund is empty. The school is unable to provide minimum required materials to the teacher due to the lack of budget*”. Most of them replied that they had to teach full periods in a day and school fund was empty.

Likewise, a huge number of head teachers expressed that trained teachers did not use instructional materials while teaching. From the observation of the school working climate, it was also found that majority of the trained teachers have less time to think about teaching, preparing plans and developing materials, discussing, interacting and sharing experiences with each other.

It was found that most of the trained teachers’ performances in the area of planning and preparation for lesson were poor. It showed that skills regarding preparation for the skills learnt in the training period were not adequately transferred in the classroom delivery because mean weight in this regard is 1.68. In other words, the effect of training with regard to preparation for the lesson is not significant. This also indicates that daily workload situations were found less encouraging for the application of the acquired skills during the training. So, the transfer of training skills in this regard cannot be interpreted positively.

Creating Learning Environment

Creating conducive learning environment through appropriate classroom management is much crucial aspect of instructional delivery. Trained teachers’ classes were also observed in order to identify the extent of transfer of training skills regarding

creation of conducive learning environment in the classroom is the basis performance indicators mentioned in the class observation form. It was found that most of the observed classrooms were found narrow with inappropriate lighting and ventilation provisions. It was also found that very few of the observed classrooms were equipped relevant materials. Only in the very few classes, small number of materials such as chart and teacher made instructional materials were displayed on the classroom walls. And other 11(73.34%) of the observed classrooms were found without relevant materials displaying on the wall. But each observed classrooms had blackboard. No classrooms were found having learning corners in the classroom. Majority of the teachers had not arranged physical environment appropriately in the classroom. Teachers paid less attention to make classroom conducive for children's learning.

While interviewing, most of the trained teachers stated that they could not create conducive learning situation in the classroom and a few number of trained teachers could create learning environment. In the challenging environment, students get opportunities to think about the situation so that they can develop their capabilities to adjust with the new situation. Joyful environment makes students ready for learning. Most of them responded that they did not create challenging and joyful environment in the classroom while teaching. While asking; *"Why couldn't you create creative learning environment?"* Hari asked, *"How can I divide such overcrowded class into small discussion groups? Where benches are tidily arranged for boys and girls in a separate and detached row and no place to search up to all students?"* Most of them 20(80%) replied they had to teach over crowded with in appropriate physical condition.

In this topic the mean weight was 2.43 which is below the rule of thumb 3 and shows the terrifying aspect of the creating learning environment. From the above discussion, inappropriate physical condition of classroom made teachers unable to create conducive learning environment. It also indicates that the trained teachers were, not

found to have developed adequate skills to create conducive learning environment and they had no enthusiasm. This shows that the teacher training had no significant effect and they need further support to enhance their classroom performance in these skills.

Commencing the Lesson

The study revealed that the majority of the trained teachers' performance was found excellent in pleasing and enjoyable opening with joking, whereas others did not perform this activity. The majority of the trained teachers' performance was seen excellent because the mean weight for this case was 4.15 which is definitely above the rule of thumb. Likewise, a large number of teachers were found more likely to give an overview of the previous lessons or ask students questions relating to the previous lessons in starting the lesson while others took the students straight to the day's lesson. Opening the textbook and starting teaching seemed to be the practical among few trained teachers. Most of the trained teachers' performance was found excellent in relating the lesson with students' experiences by giving realistic examples and others did not relate the lesson with students' experiences.

From the above discussion, majority of the teachers were found having adequate skills for commencing a lesson. It shows that the transfer of training skills in the actual classroom situation in this area can be interpreted positively.

Communication Skills

Communication is the expression, transmission and interpretation of knowledge and an idea on a skillful manner. As per the performance indicator, classroom activities were observed in order to identify whether the trained teachers communicate effectively in the classroom. It was found that majority of the teachers' are performing in very simple, clear and understandable language with loud enough, not too fast and facing the class etc. were found excellent. The main messages were clear. Likewise, few teachers were found good in presenting subject matter accurately and clearly whereas least

number of teachers' performance was found excellent in this regard because the mean weight for "communication skills" is 4.56 which is above the rule of thumb 3.

While teaching, 18(72%) teachers asked questions to the students at different moments of the teaching learning activities. It was found that most of the trained teachers asked questions to the students to check the understandings and less number of teachers asked to find out what the students already know. It was seen that memory level questions were dominant in classes taught by trained teachers because most of the teachers used yes/no questions as well as recall and open ended questions. Teachers who asked the questions, all of them were likely to address questions to the girls as well as boys and frontbenchers as well as backbenchers. It indicates that the transfer of teachers training in this regard can be interpreted positively. While questioning only 10(40%) of the teachers asked questions appropriately by the following accurate questioning process. They asked whole class, provided time to think and gave opportunities to give answers. Only a few teachers' ways of tackling answers were excellent and only similarly few teachers provided constructive feedback appropriately in students' responses.

All the trained teachers responded that they encouraged students to ask questions. Among them, 10(40%) trained teachers replied that they could ask to the students proficiently & no one could tackle students' answers appropriately. The cause for not using this skill in the classroom was the lack of practices during the training. And they were not motivated to transfer the skills into the classrooms because of the poor physical condition of the school, they expressed. According to 15(60%) head teachers, trained teachers fully used very simple language, clear and understandable with loud enough in the classroom after getting back from training. According to 12(48%) head teachers, trained teachers fully used questioning skills and encouraged students to ask questions and undertook assessment during the lesson.

From the above discussion, it can be concluded that the trained teachers' transfer of training in communication is satisfactory. This shows that the transfer of training in this regard can be interpreted positively. But trained teachers' performance was found poor in questioning techniques and students' answers tackling techniques.

Concluding the Lesson

In this study, it was found that majority of the teachers concluded the lesson by giving assignment or homework because the mean weight for the statement "Homework/assignment are appropriate" is 4.28 which is above the rule of thumb 3. Few i.e. 5(20%) teachers closed the lesson by summarizing the main points of the lesson and by assessing students' understanding of the lesson.

Discussion

The mean score of students taught by trained and untrained teachers are respectively 30.76 and 26.84. Similarly, standard deviation of the students taught by trained teachers 6.835 is less than the standard deviation of students taught by untrained teachers 8.594. From the above table, it is observed that calculated Z-value 2.27 is greater than tabulated Z-value 1.96 at 5% significance level. Thus it is found that there is a significant difference in the mean achievements of students taught by trained teachers and untrained teachers.

Through the analysis of transfer of teaching skills on the basis of performance indicators mentioned on classroom observation form, it can be concluded that the teacher training has brought change in teachers in using various teaching skills effectively and efficiently such as subject matter presentation, increasing students' participation, and linking contents to the students' own life experiences, time management, treating students with love and respect. It has also brought changes in using skills such as encouraging students to ask questions, questioning and tackling students' answers and providing feedback to the students and undertaking assessment during the lesson. But the effect of training in planning for lesson, use of textbooks, use of instructional materials and resources, creation of learning environment through appropriate classroom management, communication in the classroom

in using gesture and expressions and opportunities provided to give answers cannot be interpreted positively.

Many of the teachers of the sample schools had the views that the teacher training programmes were beneficial. They felt that these programmes have contributed to identifying the problems of the students and schools, assessing the needs of the schools and motivating students, parents and communities. They also felt that such programmes have helped them in their attempt to find out the weaknesses of the students and treat them accordingly. In their opinion, training programmes were also helpful because they provide ideas on how to link the contents with students' pre-knowledge and their daily life situation by using suitable examples. They also pointed out the problems that the teacher training programmes have hampered the classes during the training period.

Application of training in terms of planning for teaching, creating challenging and joyful learning environment, using (no cost, low cost & local) materials, encouraging students for interactive learning and cooperation among students definitely seem poor. But application of training in terms of commencing lesson, providing constructive feedbacks and linking contents to the students' previous learning experiences, treating students with love and respect, asking questions, undertaking assessment during lesson, using clear and non-threatening language seem up to the satisfactory level. However the trained teachers had above mentioned strengths and weaknesses, teacher training brings some changes such as: change in teachers' knowledge, change in teachers' skills and way of their uses, change in teachers' opinions and feelings, change in organizational capacity of the school and change in teachers' performances etc. Trained teachers created an environment of respect and understanding, established expectations that valued and promoted learning, managed learning processes effectively, organized a safe emotional environment, communicated clearly and accurately, used a varieties of teaching approaches, made students engaged in learning, provided feedback and assessed learning, demonstrated flexibility and responsibilities in the classroom activities.

Chapter V

SUMMARY, FINDINGS, CONCLUSIONS & RECOMMENDATIONS

This chapter deals with the summary, findings, its implications, basic conclusion of the research and the essential recommendations in different levels viz. policy level, practical level and further research related level. A brief discussion of this chapter is mentioned below:

Summary

This study was survey and quantitative in nature. The population of this study consisted of entire secondary level mathematics teachers of Morang district and also, all the students of grade nine of public schools of that district in the academic year 2070. The researcher employed purposive sampling technique to select the sample schools and sample students. For this study, 50 schools were selected as sample including 25 schools having trained mathematics teachers and 25 schools having untrained mathematics teachers. Also, 70 students of grade IX from the schools taught by trained and 70 students from the schools taught by untrained mathematics teachers were selected randomly. Hence the total number of students from the schools taught by trained and untrained teachers is 140.

This study was designed to find out the effectiveness of in-service teacher training programmes in teaching mathematics at secondary level and to find out current status of transfer of teacher training in mathematics classrooms. The researcher used primary data of students' achievement scores of grade IX in the annual examination of academic year 2070. On the other hand, data were collected through classroom observation form and through questionnaires for teachers and for their head teachers also.

The collected data were analyzed by the help of mean, standard deviation and Z-test for testing significance of in-service teacher training programmes in teaching

mathematics at grade 9. Weighted mean was used to analyze the information obtained from questionnaire and classroom observation form. Cross section between teacher, head teacher and obtained observation notes were used to establish the validity and reliability of the tools.

Findings

-) The mean achievement score in mathematics taught by trained teachers is higher than the mean achievement score of students taught by untrained teachers.
-) Very few teachers planned and prepared instructional materials for lesson. So, written lesson plan for teaching and preparation of instructional materials for lesson was found almost non-existent in all sample schools. Thus the effect of teacher training in this regard cannot be interpreted positively.
-) The schools' classrooms lacked adequate equipments with relevant materials. Teachers gave less emphasis on classroom decoration with relevant materials for sitting arrangement.
-) Majority of the trained teachers commenced the lesson in enjoyable manner whereas other did not perform this activity. Likewise, large number of teachers was found more likely to give an overview of the previous lesson while starting the lesson for that day and others took the students straight to the lesson. Also, majority of trained teachers related the lesson with students' experiences. This shows that teacher training in terms of commencing the lesson can be interpreted positively.
-) Majority of trained teachers (more than 80%) used very simple, clear, understandable, polite and none threatening language.
-) Majority of the trained teachers presented the subject matter accurately, linked with contents to the students' previous experiences by giving enough examples

and became able to manage time, treated students with love and respect, (80%) used question-answer method and 60% teachers undertook assessment during the lesson by asking memory level questions.

-) Few teachers created the challenging and joyful learning environment, used low cost, no cost and local materials, encouraged students for interactive learning by giving opportunities to discuss in group and healthy competition among students in the class.
-) There was a lack of proper and consistent demonstrations, discussion and practice for internalization of some concepts and practical use of these skills during the training.
-) Most of the teachers concluded the lesson by giving assignment as homework and few teachers closed the lesson by summarizing the main points of the lesson.
-) The main barriers of trained teachers are situation dissimilar to work situation, low level of teachers' dedication, no transfer strategy, lack of supervisory support, unfavourable school environment, no opportunity to practice skills, lack of competent trainers and irrelevant training course design.
-) There was a lack of continuous monitoring and follow up support to trained teachers from head teachers, supervisors and resource persons. Teacher transfers strategy or action plan in which future course of actions to transfer acquired skills is not being taken as part of training course.
-) Due to lack of teachers' dedication and motivation towards their profession, the extent of transfer of teacher training was found in a low degree.
-) There was lack of relevancy of many of the training components to the real need of the teachers and the demands of the actual classroom situations teachers might have to face. There was no greater flexibility in all aspects of the trainer's guide

to permit trainers to modify, adjust and reformulate both the contents and methods to match the requirements of the trainers in line with the objectives of the secondary level national curriculum.

Conclusion

Application of training in terms of planning for teaching, creating challenging and joyful learning environment, using (no cost, low cost & local) materials, encouraging students for interactive learning and cooperation among communication, facing students' answers and providing constructive feedbacks and summarizing the main points of the lesson definitely seems poor. But application of training in terms of commencing lesson, presenting subject matter, linking contents to the students' previous learning experiences, treating students with love and respect, asking questions, undertaking assessment during lesson, using clear and non-threatening language seems up to the satisfactory level. However the trained teachers had above mentioned strengths and weaknesses, the mean achievement of the students taught by trained teachers seems better than the mean achievement of the students taught by untrained teachers. Calculated Z-value is greater than the tabulated Z-value at 5% level of significance. Therefore, achievement of students taught by trained teachers is more significant than the achievement of students taught by untrained teachers.

Suggestions for Educational Implication

The preceding discussion has presented a clear-cut picture related to the extent of training transfer of teacher training in actual classroom and some potential measures to maximize the transfer of teacher training in the actual classroom situation are mentioned below:

-) Special training programmes should be conducted for teachers to revitalize their capacities to teach mathematics effectively. Such special trainings must update the teachers about new methods of teaching and their specific problems if any.

-) As one of the trainees reported the poor delivery of the training due to poor trainers, it is strongly suggested that only skillful, qualified, competent, dedicated, and motivated trainers should be developed and made available for the delivery of teacher training.
-) A huge number of trained teachers are found weak in the area of planning and preparation of lesson to be taught. This implies that the training should lay emphasis on planning and preparation of the lesson. For this, the concerned personnel within the SEDP system need to be sensitized, developed and prepared to carry out these initiatives.
-) It is evident that the classroom management skills on the part of trained teachers are poor. Therefore, the appropriate classroom management skills should be incorporated in the training materials so that they could be more helpful to the teachers to apply skills acquired from training and practical activities in their respective schools.
-) In order to strengthen classroom activities by using instructional materials, teachers should be provided instructional materials from the schools. The money granted to each school for purchasing instructional materials does not seem adequate. For this, the government needs to increase the amount of money given for quality enhancements.
-) This study was conducted in Morang district. To get more valid and reliable result, it can be extended nationwide.
-) A system of reward should be instituted so that every trained teacher can work towards transferring of training skills in classroom situations.
-) Majority of the trained teachers are in confusion in using various teaching skills acquired from training due to the lack of appropriate and timely feedback, the

trained teachers should be closely monitored and supervised by the school supervisors, resource persons and head teachers. A school based follow-up and supervision strategy to empower head teachers is also needed.

) Training of teachers implies the better performance of the students. So different types of training programmes are recommended in various packages. NCED should pay attention to fulfill the requirements for better performance in the field of teaching. It is obvious that there might be several other factors supporting and inhibiting training transfer in mathematics classrooms. Therefore, additional studies should be carried out incorporating these variables.

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Appendix-A

Sample Students and Their Obtained Marks at Grade IX in the Annual

Examination of 2070

S.N.	Obtained marks of sample students from group 'I' (X_1)	Obtained marks of sample students from group 'II' (X_2)
1	44	36
2	39	28
3	26	37
4	19	41
5	17	19
6	33	35
7	27	24
8	34	26
9	50	29
10	37	18
11	25	26
12	17	33
13	46	29
14	18	15
15	52	16
16	32	22
17	28	21
18	15	17
19	20	34
20	24	29
21	30	15
22	26	52
23	48	25
24	13	21
25	55	13
26	34	27
27	26	39

28	52	23
29	23	29
30	36	36
31	29	51
32	25	19
33	40	17
34	39	22
35	37	23
36	25	19
37	19	46
38	47	42
39	25	29
40	33	37
41	21	15
42	24	23
43	39	27
44	48	14
45	33	11
46	27	37
47	20	19
48	19	24
49	46	48
50	30	33
51	25	26
52	21	19
53	40	51
54	26	25
55	19	18
56	33	23
57	48	29
58	37	12
59	51	27
60	37	26

61	29	34
62	24	19
63	16	20
64	20	32
65	22	11
66	24	36
67	39	29
68	25	17
69	18	17
70	27	37
N = 70	$\bar{X}_1 = 30.76, S_1 = 6.835$	$\bar{X}_2 = 26.84, S_2 = 8.594$

Where,

Group I = Students taught by trained teachers

Group II = Students taught by untrained teachers

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 = No. of students

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

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2 + S_2^2}{N_1 + N_2}}}$$

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 marks of group I

S_2 = S.D. of the marks 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:

Name of school located place:

Name of the teacher:

Qualification/Training: Teaching experience:

Class: Subject: Topic:

Date: Period: Time:

	S.N.	Topic	VG	G	S	P	B	R
Appearance in the classroom	1	Cleanliness						
	2	Self-confidence						
	3	Punctuality						
	4	Pleasing						
Initiation of lesson	5	Clarity of the objectives of the lesson						
	6	The lesson based on the previous one						
	7	Readiness of students to learn						
	8	Starting of the lesson in interesting way						
	9	The class arranged properly						
Subject matter	10	Relevant to the textbook						

	11	Relevant to the students' level and interest						
	12	Coverage of subject matter						
Subject matter and sequence	13	Lesson is organized in sequential order						
	14	Command over subject matter						
	15	Indication of important points of the lesson						
	16	Appropriate illustrations						
Language	17	Fluency						
	18	Voice						
	19	Structure						
	20	Clarity						
Instructional materials	21	Use of chalk board						
	22	Use of extra materials						
	23	Size of materials						
	24	Appropriateness to teaching						
	25	Proper use						
Students' participation	26	Listening attentively						
	27	Follow direction						
	28	Participation in discussion with teacher						
	29	Experiment						
Teacher's activities	30	Interaction with students						
	31	Justification of students'						

		points						
	32	Solve disciplinary problems						
Closing of the lesson	33	The objectives achieved						
	34	Homework/assignment are appropriate						
	35	Evaluation came out satisfactory						
If any more behaviors								

VG=Very Good

G=Good

S=Satisfactory

P=Poor

B=Bad

R=Remarks

.....

Signature of Observer

Appendix-D

TEACHER QUESTIONNAIRE

Teacher's Name:

Male/Female:

Years of service training:

Direction:

Please 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's purely a research study that the researcher has undertaken as requirement to complete the Master's Thesis.

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

.....

S.N.	Statements	SA	A	U	DA	SDA
Trainee Characteristics						
1.	Thanks I am a teacher.					
2.	Teacher can determine the future course of nation.					
3.	Teaching is respectable job.					
4.	Teaching profession is better than other professions.					
5.	Teachers are respected from the society.					
6.	Teachers should present themselves as "Model Citizens" in the society.					

7.	Discipline problems are teachers' greatest worries.					
8.	A teacher should not be expected to burden himself with pupils' problems.					
9.	Teachers' job does not end with the end of school hours but they should feel pleasure whenever students approach them for any sort of help.					
10.	A teacher should always aspire to develop good relations with his students.					
Training Design						
11.	Teachers should be familiar with the aims and objectives of secondary education programme as stated in the NEDP of Nepal.					
12.	Teacher should be well acquainted with the descriptions of the objectives of mathematics programmes at the secondary level.					
13.	Of all the subjects, I enjoy teaching mathematics the most.					
14.	I am aptly read and trained to teach mathematics in the secondary level.					
15.	I am well reached with the principles and theories involved in the teaching of mathematics.					
16.	My level of know-how about planning (annual plan, unit plan and daily plan) is good enough.					
	If "yes", how do you make plans? (annual as well as unit plan).....					
	I don't make plans (yearly as well as unit plans) because I don't know how to do it.					

17.	I make daily lesson plans.						
	If "not", why? because						
	I.	Of heavy teaching load					
	II	It is not practicable.					
	III	I don't make lesson plans because it is cumbersome and impractical.					
	IV	I don't have the required knowledge to do it.					
V	If any others.....						
18.	I believe that the use of materials enhances mathematics learning.						
	If "yes", how?						
19.	I make and use teaching materials frequently to motivate my students to make mathematics more meaningful.						
	If "not at all", why? because						
	I	The materials are not easily available and funds required are not easy to get.					
	II	Instruction by using materials consumes a lot of time and course cannot be completed in time.					
	III	I don't get encouragement and suggestions to make and use materials.					
20.	I believe that students must be engaged in planning and directing their own activities in the learning process, especially mathematics.						
	If "yes", why?						
	If "no", why? because						

	I.	It consumes a lot of time and course cannot be completed in time.					
	II.	It is not possible in big class.					
	III.	Students don't know about planning.					
Work Environment							
21.		Students are just like storing machines (like computers) where facts and information are stored to retrieve later.					
22.		Students should be encouraged to learn and discover mathematical entities (e.g. laws, principles, theories, concepts etc.) by themselves rather than by being taught and explained exclusively by the teachers.					
23.		I believe in the principles of motivation in teaching mathematics.					
		If "yes", why? because					
	I	Without motivation teaching becomes extremely difficult.					
	II	It is necessary for effective teaching.					
	III	It develops interest in students to learn mathematics.					
		If "not", why?					
24.		I am cognizant with the technique of motivation					
		If "yes", give examples.....					
		If "no", why?					
25.		I believe in teaching mathematics by involving students in discussion.					
		If "yes", do you encourage pupils to ask questions and engage					

	in discussion?					
	If "no", why?					
26.	Do you think that your knowledge of different approaches to teach mathematics is adequate?					
	If "adequate enough", can you give some examples?					
	If "not adequate", why?					
27.	Evaluation of students should be done at most 3 times of session.					
	If disagree, why?					
28.	Students should be constantly evaluated almost every day in every lesson.					
29.	I love children and enjoy working with them.					
30.	Children are very difficult to deal with.					
31.	I have a substantial knowledge about the child psychology and growth.					
32.	Children should be made to learn mathematics by committing to memorize.					
33.	Children learn best when pin-drop silence is maintained in the class along with strict discipline.					
34.	Children learn best if they are punished severely and regularly for not learning satisfactorily.					
35.	I believe mathematics is a strict discipline by any means.					

Where, SA-Strongly Agree, A-Agree, U-Undecided, DA-Disagree, SDA-Strongly Disagree.