

# CHAPTER I

## INTRODUCTION

### 1.1 Background of the Study

Mathematics is the backbone of our civilization it is not the exaggeration to say that history of mathematics is the history of mankind. Mathematics has led to the development of various subjects, vocations and technology. It is the science which is still playing an important role in various ways of life. We can relate the mathematics to history logic, science, daily life, social science, art, music and literature as well as different aspects.

Mathematics as a discipline is the out growth of different human civilization for developing rules, formulae and mathematical system. Mathematics arose from the need of organized society of people. Imagine a primitive tribe living by hunting and collecting their natural harvest of forest and field. Rudimentary forms of counting are needed to communicate number of animals in a heard or the number of people a hostile tribe. Similarly they needed measures at sizes, strength distance and time. It is also important to have some means of describing location involving both distance and directions. Thus even in a primitive society, certain intuitive concepts which later developed into mathematics in necessary. Moreover, this primitive tribe needs something of virtually all the great branches of specialization mathematics.

Mathematics is an important subject, which is inseparable discipline of human life because of its usefulness in each and every human activity. Mathematics has direct impact for the development of physical and social science. It is the base of scientific development of modern technology. It is also very useful tool in the commercial as well as industrial field. All scientific discoveries are depending upon the mathematics because mathematics is the backbone of studying science and it supports well is the concentration of the related study. Mathematics provides techniques in reading very useful information of figures, tables charts diagrams, graphs, geometrical, technical drawing and so on.

Supporting about the importance of mathematics for the human life, "The school mathematics study group America" Published a progressive report in 1959 has stated the role of mathematics as:

"The world of today demands more mathematical knowledge on the part of more people than the world of yesterday and the world of tomorrow will make still greater demands our society learns more and more heavily on science and technology. The number of our citizens, skilled in mathematics must be greatly increased and understanding of the role of mathematics in our society is now pre requisite for intelligent citizenship. Since no one can predict with certainty his future profession it is important that mathematics be so taught that students will be able in later life to learn the new mathematical skills which the future surely demand of many of them."

The mathematics has been defined in various ways. It is related to measurement, calculation, discovering relationship and dealing with the problem of space.

According to John Locke "Mathematics is a way to settle in mind a habit of reasoning", however, it is a narrow definition for this subject. According to James. G (1986) "Mathematics is the logical study of space arrangement quality and many related concepts.

According to Oxford Dictionary "Mathematics is the science of numbers and space." According to the new standard dictionary of English language Funk and Wagnalls (2000) "Mathematics is the science that treats of quantity or magnitude and of their measurement especially by the use of symbols and that investigates deductively the spatial, serial and numerical relationship existing between objectives of perception, in wider sense, the group of allied sciences concerned with the concrete application of such data.

However, there is not specified division of mathematics; 'Algebra', 'Analysis', and 'Geometry' are considered as parts of mathematics. This study is closer to geometry. The growth and development of geometry is seen from ancient age. Babylonian geometry is intimately related to practical mensuration.

The chief feature of Babylonian geometry is its algebraic character. The essentially nontrivial algebra problems.

Geometry considered as a tool for understanding, describing and interacting with the space (with and without motion) in which we live, is perhaps the most intuitive, concrete and reality linked part of mathematics.

The outstanding historical importance of geometry in the past, in particular as a prototype of an axiomatic theory, is so universally acknowledged that it deserves no further comment. Moreover, in the last century and specifically during the last decades, as **Jean Dieudonne** asserted at ICME IV (Berkeley, 1980), Geometry "*bursting out of its traditional narrow confines has revealed its hidden powers and its extraordinary versatility and adaptability, thus becoming one of the most universal and useful tools in all parts of mathematics*". (ICMI VI, 1980)

Some aspects of geometry can be stated as the science of space. Geometry, as a method for visual representations of concepts and processes from other areas in mathematics and in other sciences eg: graphs and graph theory, diagrams of various kinds, vector geometry, Geometry is a meeting point between mathematics as a theory and mathematics as a model resource. Geometry is a way of thinking and understanding and at a higher level, as a formal theory, Geometry is a paradigmatic example for teaching deductive reasoning, Geometry is a tool in applications both traditional and innovation,

The thinking about vector became many years later than the thinking about geometry, When we consider the geometrical concepts, ideas with motion or sense; it is becoming the creation on the ideas of vector, Vector, the concepts of geometry on real world, is application of geometric or graphic constructions.

One of the new applications of mathematics is the concept of vectors at school level. the history of the development of vector concept started only in the middle age of 19th century in the beginning stage the American physicist Josiah Willard Gibbs (1839-1903) encountered by every student of elementary physics .

A vector is graphically reared as a directed line segment or arrows and the vector are made of addition and multiplication.

According to Murray R. (1973), "In recent years vector is an essential part of mathematics background required by engineers, physicists, mathematicians and other scientists, It might very well be considered a most rewarding language and made of through for physical science. "

All the countries have its own national goals according to the requirement of society; and that countries make the educational curriculum based on his national goal, In the context of Nepal, The system of political change in our country is forced to change the running National Educational System.

After the implementations of the Act, optional mathematics has been included as a first optional paper in the secondary level. The National Education Commission (2049-2050). was added important suggestion for improvement of education, Curriculum Development Centre (CDC) reformed the curriculum of subjects of all levels, Accordingly in 2056-2057 the new topics such as Vectors, Transformations, Relation & Function, and Linear programming problems were included in the curriculum at secondary level optional mathematics paper.

The course of study of S. L. C. examination was the combination or course of study of class nine and ten, But according to the challenge and requirement of 21<sup>st</sup> century on education, Ministry of Education determined from 2063 that the course of study of S. L. C. examination is only the course of study of class ten,

The past S. L. C examination results showed that most of the students failed in mathematics subject compared to other subjects. The result of government schools is worse than private schools. It claimed that many more problems such as traditional teaching methods, lack of teaching materials, lack of qualified dedicated and trained teachers, poor learning management in school, mathematics lab etc,

Problems relating to mathematics learning is directly affected the achievement in teaching mathematics, This is a great threat to the mathematics

teacher. Some problems of learning mathematics in student might directly be related to the teachers' academic background, classroom practices, school management and leadership. Other problems or learning mathematics are concerning with the pre-knowledge of students, Generally students may feel learning mathematics problems related in understanding the new concepts and relations, Bhattarai (2005) showed the sources of problems in learning as relevancy of textbook in daily life, teaching learning activities, classroom management, physical facilities, evaluation techniques and inherent potentiality and circumstances of the individual learners.

Other aspects which raise the problems to students and teachers are the attitude and beliefs of mathematics teachers, students and parents, also the inter-relationship among them, Problems without occur through size of classroom, facilities available in classroom, number of students in a class. The achievement of homogeneous arrangements of students in classroom might be better than the heterogeneous, The crowded classroom is one of the major problems of implementing interactive teaching and learning situation, Bhatia and Bhatia (1987) said about the modern mathematics classroom that the teachers tools have long consisted of chalk, black board, red pencil and text book, However, nowadays are the use of models of various shapes and sizes, slide rules, overhead projectors, drawing instruments, graph stencils, measuring instruments, and many pictures, pamphlets, books and mathematical magazines, Films, slides, manipulative kits, teaching machines and computers are being used in teaching mathematics in the modern classroom.

From the above it is usually seen that those students and teacher who have been teaching-learning mathematics; they are facing with number or problems to deal with. The problems which are occurring to mathematics are also the problems of vectors teaching and learning, The main purpose of this study is to identify the cause of occurring problems to teacher and students at teaching-learning on vectors.

## **1.2 Statement of the problem:**

This study would be concerned with the problem faced by students and teachers in teaching-learning vectors. This study has sought the answers to the following research question:

- ) What problem do students and teachers face in teaching-learning activities on vectors?
- ) What are the problems on transferring the knowledge of vectors into the students?

## **1.3 Objectives of study**

The study is based on the following objectives:

- ) To find the problems of teachers and students in teaching-learning activities on vectors in Parbat district.
- ) To identify the pre-knowledge of students and teachers in vectors as well as to determine attitude, belief and interest of students in vectors.

## **1.4 Significance of the study**

This has demanded a deeper and wider study on problems faced by students and teachers in teaching-learning vectors. It is also essential that the researcher will have given input for making teaching strategy activities. It has led to the following issues:

- ) It is helpful to students and teachers for vector teaching learning.
- ) It is helpful to mathematics educators and teachers to prepare models on vector teaching learning.
- ) It is helpful to teaching to prepare and implement instructional teaching learning.
- ) It is beneficial to researchers for further research on vector teaching learning.
- ) It is beneficial to policy makers, educationists, mathematics educators to make further curriculum policies.

## **1.5 Meaning of related terms**

### **Problems**

Problems in mathematics refer as things that are difficult to deal with or understand during learning mathematics. In this study problem of students and teachers in teaching learning activities on vector are difficult to understand and solved related vector questions.

### **Public school**

The schools that are established by government are called public schools.

### **Urban school**

The school which lies 1 km boundary of highway.

### **Rural School**

The school which lies in remote area.

### **Vector**

Those quantities which have magnitude and direction is called vector. It is represented by directed line.

### **Attitude**

Attitude is the way of thinking or opinion of any themes. In this study, usefulness and coordination of vector with other topics of mathematics show the attitude of students and teachers towards vector learning.

### **Interest**

Interest refers the tendencies to seek out and participate in certain activities. In this study, the involvement of teachers and students in the learning vector and doing assignment of vector show the interest of teachers' and students' on vector.

### **Belief**

Belief refers the acceptance as true. In this study, students' concept and confidence in their ability to learn vector shows students' belief. Feelings, expectation of teachers shows teachers' belief on vector.

## **1.6 Limitation of the study**

- ) The study considers only Parbat district.
- ) This study was carried out in only two government schools which have problems on teachers and student on vector teaching-learning activities.
- ) The study was concerned with only those students who are studying and those teachers who are teaching optional mathematics in secondary level.
- ) The sample schools were taken randomly by researcher.
- ) This study was done on the basis of interview, observation forms and recorded history about schools.



## **CHAPTER II**

### **REVIEW OF LITERATURE**

There have been studies about review related literature and framework for the study. Theoretical literature describes learning theories on mathematics. That is helping to construct the framework to achieve the objectives of this study. Also this chapter deals the review of other related literature about facing problems concerning with curriculum, teaching instructions, method and materials teachers' & students' characteristics on teaching activities etc.

#### **2.1 Theoretical Literature**

A major theme in the theoretical framework of Bruner is that learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge. The learner selects and transforms information, constructs hypotheses, and makes decisions, relying on a cognitive structure to do so. Cognitive structure (i.e., schema, mental models) provides meaning and organization to experiences and allows the individual to "go beyond the information given".

As far as instruction is concerned, the instructor should try and encourage students to discover principles by themselves. The instructor and student should engage in an active dialogue (i.e., Socratic learning). The task of the instructor is to translate information to be learned into a format appropriate to the learner's current state of understanding. Curriculum should be organized in a spiral manner so that the student continually builds upon what they have already learned.

Bruner (1966) states that a theory of instruction should address four major aspects: (1) Predisposition towards learning, (2) the ways in which a body of knowledge can be structured so that it can be most readily grasped by the learner, (3) the most effective sequences in which to present material, and (4) the nature and pacing of rewards and punishments. Good methods for structuring

knowledge should result in simplifying, generating new propositions, and increasing the manipulation of information.

In his more recent work, Bruner (1986, 1990,1996) has expanded his theoretical framework to encompass the social and cultural aspects of learning as well as the practice of law.

([http://carbon.cudenver.edu/~mrydeer/itc data/constructivism.html](http://carbon.cudenver.edu/~mrydeer/itc_data/constructivism.html).)

Bruner describes the general learning process in the following manner. First the child finds in his manipulation of the materials regularities that correspond with intuitive regularities it has already come to understand. According to Bruner the child finds some sort of match between what it is doing in the outside world and some models or templates that it has already grasped intellectually. For Bruner it is seldom something outside the learner that is discovered. Instead, the discovery involves an internal reorganization of previously known ideas in order to establish a better fit between those ideas and regularities of an encounter to which the learner has had to accommodate.

Component Display Theory (CDT) classifies learning along two dimensions: content (facts, concepts, procedures, and principles ) and performance (remembering, using, generalities) . The theory specifies four primary presentation forms: rules (expository presentation of a generality), examples (expository presentation of instances), recall (inquisitory generality) and practice (inquisitory instance). Secondary presentation forms include: prerequisites, objectives, helps, mnemonics, and feedback.

**Table 2.1 : content and performance**

Level Of Performance	Find				
	Use				
	Remember				
		Fact	Concept	Procedure	Principle
		Types Of Content			

Vygotsky's zone of proximal development has many implications for those in the educational milieu. One of them is the idea that human learning presupposes a specific social nature and is part of a process by which children grow into the intellectual life of those around them (Vygotsky', 1978). According to Vygotsky (1978), an essential feature of learning is that it awakens a variety of internal developmental processes that are able to operate only when the child is in the action of interacting with people in his environment and in cooperation with his peers.

Therefore, when it comes to language learning, the authenticity of the environment and the affinity between its participants are essential elements to make the learner feel part of this environment. These elements are rarely predominant in conventional classrooms.

A classroom that makes the best use of all of its students' ZPDs should follow the following guidelines:

1. The teacher should act as a scaffold, providing the minimum support necessary for a student to succeed. The idea is to assist without denying the student's need to build his or her own foundation. The challenge for the teacher, then, is to find the optimal balance between supporting the student and pushing the student to act independently. To effectively scaffold the student, the teacher should stay one step ahead of the student, always challenging him or her to reach beyond his or her current ability level. However, if instruction falls outside of the zone (above or below a student's ZPD), no growth will occur.

2. To effectively scaffold students within their ZPDs, a teacher should also have an awareness of the different roles students and teachers assume throughout the collaborative process. The roles roughly resemble the following:

- teacher modeling behavior for the student

- student imitating the teacher's behavior

- teacher fading out instruction

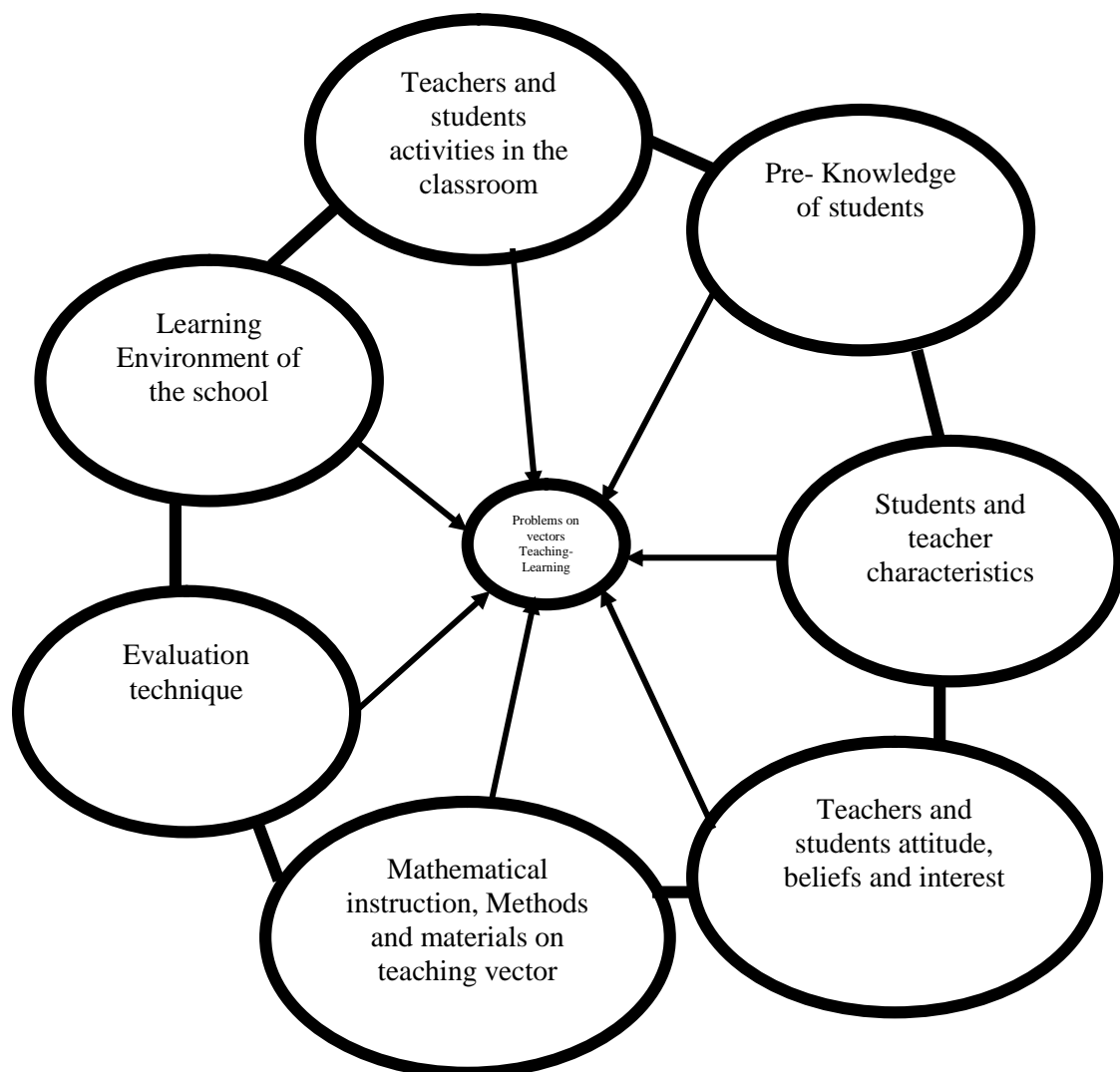
- student practicing reciprocal teaching (scaffolding others) until the skill is mastered by all students in the classroom.

3. The classroom should be set up in such a way to foster group work and student collaboration in order to allow students to take on the role of instructor with their peers as they master the skills at hand.

## 2.2 Conceptual Framework

The teaching-learning problems of mathematics are already explained above. Thus the problems on teaching-learning in topic vectors are also considered as the problems of mathematics. This case study is mainly based on the already explained problems of teaching -learning. This case study is focuses to identify whether the problem on learning occurs and the cause of problems on vectors. The framework for mathematics learning problems on vectors is figured as

**Fig. 2.1: A framework of Problems on Vectors teaching- learning**



### **2.3 Research Review**

Some of the research studies related to this study have been reviewed below.

Sharma (2000) has conducted their study "A comparative study of the achievements of students of grade IX in the topic 'vectors' of secondary school mathematics curriculum". He concluded that the topic vector is appropriate to study in optional mathematics at grade IX of secondary level.

Pathak (1986) has conducted his research study entitled, "A study on the problems faced by the teacher of kathmandu district in the implementation of mathematics curriculum for lower secondary school". He concluded that the problems regarding evaluation were the most serious problems to the lower secondary level mathematics teachers.

Maharjan (2056) has studied the research on "Teaching Mathematics in secondary school", that the combination between different concepts and relations is known as mathematics. He has concluded that knowledge and skill of mathematics is the regular on going process.

Lamichhane (2001) has conducted a research study entitled "A study of problem faced by the secondary level mathematics teacher in teaching mathematics in Kaski district" The concluded that several problems up in the eyes of teachers such as inadequacies of text book and teacher guide, Lack of instructional materials, irrelevancy of teacher's training. Lack of supervisors help, Lack of physical facilities etc. Further he concluded that the lack of motivation to learning mathematics is poor on the part of students.

Bhattari (2001) has carried out a research work on "Attitude of ninth grade students towards geometry and its relation with their achievement". His thesis was the type of learning research, with the objectives to identify the status of attitude of grade nine students in geometry and to relate the status of achievement of grade nine students in geometry with their status of attitude towards thesis subject. He concluded that boys' achievement status was found to be better than girls in geometry and students from urban performed better than

the students from rural. He also concluded that the significant relationship was found to be existed between students' attitude status and achievement status towards geometry.

Nath (2002) has conducted his research study on the topic "A study on the effects of previous knowledge on the learning achievement of mathematics". His study was especially on the topic trigonometry with the objectives to determine the effect of previous knowledge on the learning achievement of students in mathematics (trigono) and to compare the achievement of boys and girls in trigonometry. He concluded the research work as the previous knowledge of the students played a significant effect on students achievement in trigonometry and the previous knowledge could helpful to enhance the students learning achievement.

Basnet (2003) has conducted a research study entitled "Teaching problems faced by the mathematics teacher in existing curriculum of grade eight in Jhapa District. He concluded that the teachers and students are facing many problems due to the lack of training orientation opportunity for the Mathematics teachers in existing curriculum. inadequacy of textbook, Lack of the teachers guide and reference book, Lack of physical facilities in the classroom, large class size, deductive evaluation system and so on.

Bhattra (2005) has studied a research study entitled "A study problem faced by the mathematics students in existing curriculum". He concluded that learning mathematics in secondary level was distributed by so many factors such as lack of teachers involvement in curriculum planning, Lack of referential and instrumental facilities and aids, students with weak background in the subject matter, students deductive promotion policy, lack of opportunity given to upgrade their knowledge and huge numbers of personal problems of the students and teachers.

Chaulagain (2005) has done a study on "A study of problems faced by secondary school mathematics teacher in teaching geometry". He has concluded that geometry teaching and learning is not satisfactory level at Kathmandu

district, both trained and untrained teachers have been facing more or less similar problems and public as well as private school teachers are facing almost similar kinds or problems.

Achary (2006) has done a research study entitled " A study on the problems faced by HSEB mathematics teacher in teaching of grade XII" . He concluded that study prescribed curriculum and the existing text book are not well planned, not sequential and practical problems are not well managed. It also concluded that trained and untrained teachers, both were facing similar kinds of problems in Kathmandu district.

Limbu (2007) has carried out a research study entitled "A study of problems faced by the students in geometry at secondary level". He concluded that several problems such as; problems on solving parallel problems related with exercise due to the large number of students and time boundary, difficulties on proving theorems because lack of pre-requisite of subject matter, problems on teaching guidance for solving problems and problems on teacher's participation in classroom activities.

Subedi (2008) has conducted "A study on problems faced by female mathematics teachers belonging to ethnic groups in teaching mathematics at primary level in Kaski district". He concluded female teachers do not receive opportunities to undertake training due to their familial obligations. Negative attitudes held by people about pregnancy also assist to create the problems.

Shah (2008) has prepared "A study on problems faced by students and teachers in teaching and learning vector". He has concluded that problems are becoming on vectors teaching learning due to students' weak pre-knowledge about vectors and poor geometrical background.

K. C. (2009) has done a research study entitled "Problem faced by students in compulsory mathematics at secondary level". Researcher conclude that learning compulsory mathematics in secondary level is affected by so many factors such as illiterate parents, low economical status, poverty of parents and lack of encouragement for study, the gap between low achiever and high

achiever students, unavailability of teaching and learning materials, lack of mathematical lab, lack of sufficient furniture and physical facilities, lack of trained teacher are problem faced by students in learning mathematics in secondary level. Also lack of good administration sufficient budget for school often arriving late to class is problem for students.

Different research has studied different research work. Parbat district is in western region of Nepal. There is no research work on Problems faced by students and teachers in teaching- learning activities on vector in Parbat district. So, the researcher is trying to show its Teaching -learning activities of vector status.



## **CHAPTER III**

### **RESEARCH METHODOLOGY**

#### **3.1 Research design**

Research design is the specification of method and procedure for accruing the information needed to structure of to solve problems. Research design is an integrated framework of the whole study that guides the researcher in formulating, implementing and controlling the research work. In this study, problems faced by students and teachers in teaching - learning activities on vector in Parbat district has been studied. The nature of study will be qualitative research as well as descriptive research design.

#### **3.2 Sample of Study**

Parbat district is rural Centre in Nepal. It is located in the western development region of Nepal. There are 81 secondary schools with 73 public and 8 private schools in Parbat district. Only a few school of the district are effective other are ineffective schools. Only two schools (APPENDIX 8)is selected according to the convenience and judgmental basis and their data related to Problems faced by students and teachers in teaching - learning vector. The secondary schools from urban area is denoted by "School X" and rural area is denoted by "School Y" were selected. The main purpose of this study is to identify the cause of facing problem in teaching-learning of vector. For this purpose researcher consulted with head teachers, mathematics teacher, students and parents.

#### **3.3 Sources of Data**

Both primary and secondary data are used for this study. The sources of secondary data are annual reports, the websites and various has been obtained from study schools of Parbat district.

#### **3.4 Selection of Respondents**

The respondents of this case study were head teacher, mathematics teacher, parents and 6/6 students from respective each sample school; total 12 students who studied optional mathematics at secondary level. The criteria of

selecting students were different ethnic/ caste, gender, family status about education etc. The student of school X and Y were denoted by "Student X" and "Student Y" respectively. The family status was categorized in two sections if all the members of family have higher education then it is noted as "Educated Family" other than it is noted as "Literate Family". The parents of sample students, the math teacher who taught at secondary level optional mathematics and head teacher of sample schools were selected for this study. The mathematics teacher, head teacher and parents of School X and School Y were denoted by "Teacher X" and "Teacher Y", "Head Teacher X" and "Head Teacher Y", "Parent X" and "Parent Y" respectively.

### **3.5 Tools**

The main tools used in the field to collect primary data were observation forms and Interview Formats. The already established class observation form (APPENDIX 1) was used to observe the activities of teachers and students at learning in the classroom. Researcher constructed four Interview Formats in semi-structured form. (APPENDIX 2) was used for head teachers to find out physical facilities, learning environment, policy of schools, and parental involvement in schools. (APPENDIX 3) was used for mathematics teacher to find out faced problems, teaching strategies, use of teaching materials of vector teaching. (APPENDIX 4) was used for students to find out faced problems of vector learning, attitude, beliefs and interest on vector. (APPENDIX 5) was used for parents to find out learning environment of home, responsibility for child and involvement in school. Researcher studied other schools' recorded documents related to selected respondents that are schools' profile, teacher and students' profile, student attendance register, and result sheet.

### **3.6 Data collection procedure**

The researcher went to each sample school with tools to collect the qualitative data. Researcher took class observation of vector teaching of secondary level attending behaviorally with students and teacher. In that period researcher observed carefully and recorded each and every notable activity of

students and teacher in the observation form. Also researcher took interviewing with Head teacher, Mathematics teacher, Students and parents of case students with the help of guidelines of semi-structured interview Format. The researcher listened the replied of respondent curiously and noted properly.

By reviewing the schools' recorded documents, attendance, profile, result sheets; researcher noted punctuality, characteristics and other behavior of respondents. By observing surrounding environment of school, conditions of mathematics lab, other facilities of school and interviewing with head teacher as well as document analysis of school; learning environment were seen.

Some supplementary data and information and literature review have been collected from the P.N. campus library and other published and unpublished documents by the concerned authorities.

### **3.7 Data Analysis and Interpretation**

Presentation and Analysis of the collected data is the core of research work. The collected raw data are first presented in systematic manner in tabular forms and are then analyzed by applying different logical ways as well as with the help of conceptual Framework to achieve the research objectives. For this purpose the collected sets of data were coded on the basis of respondents and types of faced problems. Faced problems on vector teaching - learning and learning environment of school were categorized by the themes of observed form, the summarized problems mentioned by researcher on observation form and the problems found from interview format. The validity and reliability of this case study were maintained through cross matching or triangulation.

## **CHAPTER IV**

### **PRESENTATION AND ANALYSIS OF DATA**

This chapter deals with the presentation and analysis of the data. The researcher collected qualitative data from the respondents (students, mathematics teachers, head teachers and parents). The data had collected from Nava Jagrit Higher Secondary School denoted as "School X" and Jana Netra Higher secondary school denoted as "School Y". The researcher had done direct observation with the help of already established class observation form to observe the activities of teachers and students at learning in classroom. The researcher observed carefully and recorded each and every notable activity of students and teachers. The researcher took face to face interviews with head teachers, mathematics teachers, students and the parents of case students with the help of guidelines of semi-structured interview formats. The researcher listened the replied of respondents curiously and noted properly. By reviewing the schools' recorded documents and the surrounding environment of school; cause of becoming problems on vector learning be analyzed. The collected sets of data were coded on the basis of respondents and types of faced problems. Faced problems on vector teaching - learning and learning environment of school were categorized with the themes of observed form, summarized problems mentioned by researcher on observation form and the problems found from interview format. The validity and reliability of this case study were maintained through cross matching or triangulation. The collected data and information was analyzed and interpreted on the headings; learning environment of the case school, teacher and students activities in the classroom i. e. the role played by teacher and students in class room, required pre- knowledge of students for learning vector, teachers and students characteristics, teachers and students attitude, belief, interest on vector, teaching methods and evaluation technique promoted by teacher for vector teaching.

## **4.1 Learning Environment**

Learning environment is the totality of the education atmosphere in the school, home and society. It is the surrounding element attached to students for gaining quality education. Learning environment of school is seemed to the main component of well achieving in education. The learning environment of school is to create good images towards teachers students and community or the member attaching to school. The location of school, physical facilities available in school, S.L.C. examination result, involvement of students in extra curricular activities, the role played by administration to client, relation among the teachers, students, parents and community, public images towards school, demography of mathematics teacher and head teacher of school, surrounding environment of home and society of students, family background about education of students, culture of the school etc. are the factors as the learning environment for students. From the above factors only the location of schools, physical facilities of schools, S. L. C. results of last 5 years, students' relation with reaches and others, public image towards school, and environment of home and society were analyzed below.

### **4.1.1 Location of Schools**

#### **Location of school X**

Situated in the northern part of Parbat district, Shree Navagagrit Higher Secondary School was established in 2023 BS at ward number 6 of Tilahar VDC . It is 12 Km northeast of the district headquarter Kusma. It is located near the modikhola in the west, Ratikhola in the east and on the lap of attractive green hill and snow capped mountain like Annapurna and Machhapuchhre. There is the Pokhara Baglung highway in the east and ungravelled motorway in the east. There is the Dhandapakha community forest in the north and some residency in the south. It is situated in the main community of Brahman, Chhetry, Dalit and other castes. Most of the students and teachers are also come from neighbor community, some of them have own home in VDC and others have rented rooms. Some students are from local community and only of few students are

from different places of the other VDC. The students of school are multicultural and multi-ethnicity.

(Source : SIP of NJHSS, 2068BS Shrawan, Tilahar.)

### **Location of School Y**

Jana Netra Higher Secondary School is located Dhaulagari zone, Parbat District, Deupur VDC, Ward number 8, in western development center of Nepal. It is situated at the center top hill of Deupur VDC. Deupure VDC Ward number 3, Gairathok in the east, ward number 6 Phalate and 7, Deurali lies in the southern side. This School view Machhapuchhre and Annapurna in the north east direction. This school is surrounded by forest nearly all sides. The natural environment of this school is quite fair. It is situated in the main community of Brahman, Chhetry, Dalit and other castes. Most of the students and teachers are also come from neighbor community, some of them have own home in VDC and others have rented rooms. Some students are from local community and only of few students are from different places of the other VDC. The students of school are multicultural and multi-ethnicity.

Source : SIP of JNHSS, 2068BS Shwran, Deupur

### **4.1.2 Physical Facilities of Schools**

#### **Physical Facilities of School X**

Nava Jagrit Higher Secondary School has 45 Ropani of land compound of school is bounded by permanent walls. It has 10 buildings. Rooms of school are large in size, plastered, well ventilated. Out of 22 rooms only 15 rooms are kept for teaching purpose and there are one library room and one practical room. The school has enough land with well prepared for playing. Staffs rooms are well furniture. The facility of toilet is separated for boys, girls and staffs.

#### **Physical Facilities of School Y**

Jana Netra Higher Secondary possesses good physical facilities. It has five building. Among them one building is used for primary level (1up to 5 grades) which is situated separately at Deupur VDC ward number 1 Kotmaidan. Other there building are used for grade six up to twelve which are at ward number 8. It

has a computer lab and a library assisted by Room to Read Nepal and student association of Budanilakantha School Kathmandu. Here is no football ground and well equipped science laboratory. It has electricity supply and water taps. There are separate toilets for girls & boys and staff too.

### 4.1.3 SLC Results of the Past Five Years

#### Jana Netra Higher Secondary School

It is government type school. It was participated in SLC examination since 2048 BS. By reviewing the SLC results form 2063 to 2067 BS, The success rate of school is rich. The SLC results of the Past Five Years of JNHSS during the study period are given in Table 4.1.

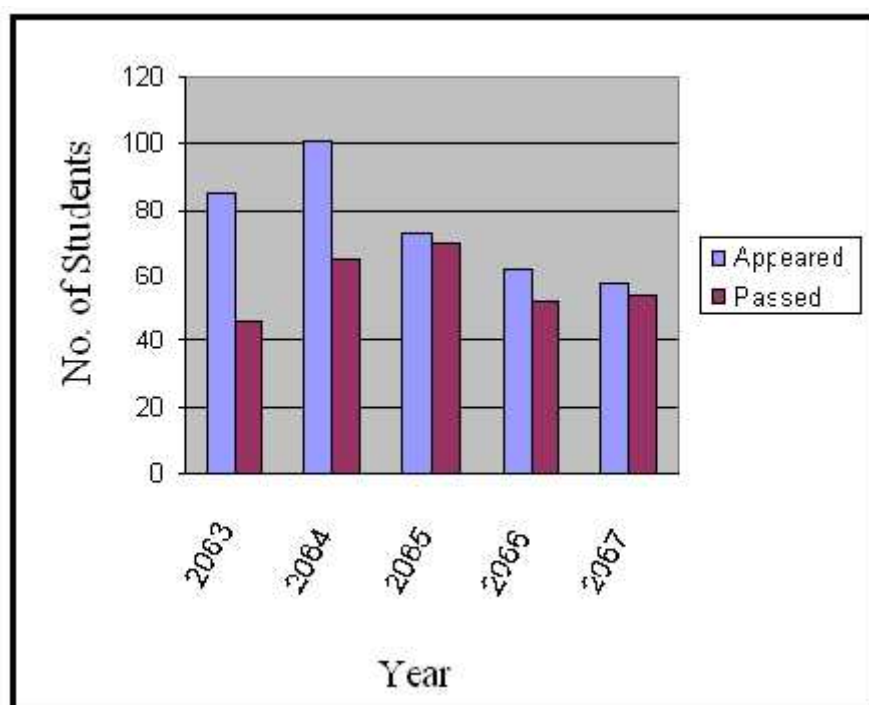
**Table 4.1: SLC Results of JNHSS  
(Year 2063 BS through 2067BS)**

Year	No. of Total students				No. of students in Opt. Math		
	Appeared	Passed	Failed	Passed %	Appeared	Passed	Passed %
2063	85	46	39	54	12	12	100
2064	101	65	36	64	13	13	100
2065	73	70	3	95	12	12	100
2066	62	52	10	80	7	7	100
2067	57	54	3	94	6	6	100

Source: JNHSS, 2068BS Shrawan, Deupur.

Table 4.1 shows that the result of 2063 is lowest, that is 54% and result up 2067 is best. The result of optional mathematics seen better than whole result but while the data of SLC result took from the Ledger of School; researcher found that the marks obtained by students in optional mathematics was 100%.

Fig. 4.1 : Bar Diagram of SLC Results from 2063 - 2067



"Most of students are not regularly class attempt. The school need to filter weak students in SLC sent up exam. But by the pressure of parents, school had to send up all the students for the SLC exam".

(Head teacher Y)

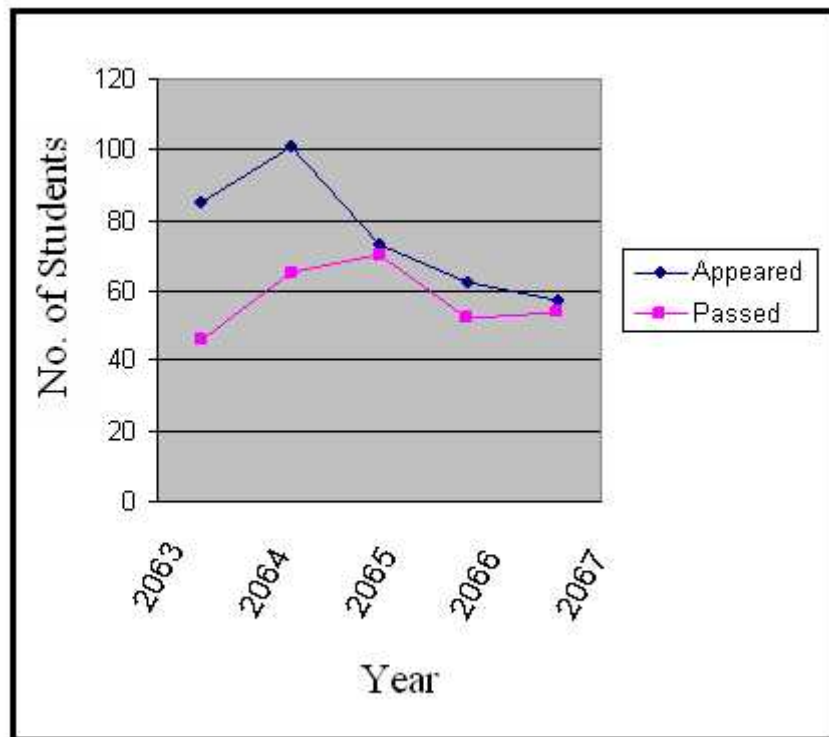
"The students have not basic knowledge. Most of students leave to solve the vectors problems in examination. Usually, the question of vector geometry asked in SLC examination was out of text book prescribed by Curriculum Development centre".

(Teacher Y)

Table 4.1 shows that SLC result of every year is fluctuating during the study period. Vygotsky, teachers served as mediators who coached and encouraged students to formulate their own level of understanding. Each student has a base level of knowledge, but they can increase it by practicing what they know well and adding onto it. The social interaction between the student, teacher and other students reinforces their increase of knowledge.



Fig. 4.2: Time Series of SLC Result From 2063 - 2067



The above views of teachers show that students have not basic knowledge of mathematics. There is lack of practicing to solve mathematics problems. Not well participated in extra classes. Question of vector geometry asked in SLC exam was out of text book.

But Vygotsky tells that each student has a base level of knowledge. Teachers should serve as mediators; coached and encouraged students to formulate their own level of understanding. But he is also emphasis to practice the subject mater.

Hence it is sought that the becoming problems in- vectors are; most students leave the vectors questions in examination. Lack of practice for learned topics. The reasons behind those problems are; students and teachers are not using extra books beside the text book prescribed by CDC. Also there is lack of motivation and encouraging to students because students are not well participated in extra classes due to students because students are not well participated in extra classes due to high fee.

### **Shree Nava Jagrit Higher Secondary**

It is a government type having more number of students with greater facilities. It By reviewing the SLC result form 2063-2067 BS, the success rate of school is beater. The table given below shows the SLC result of last five years of school X during the study period are given in Table 4.2.

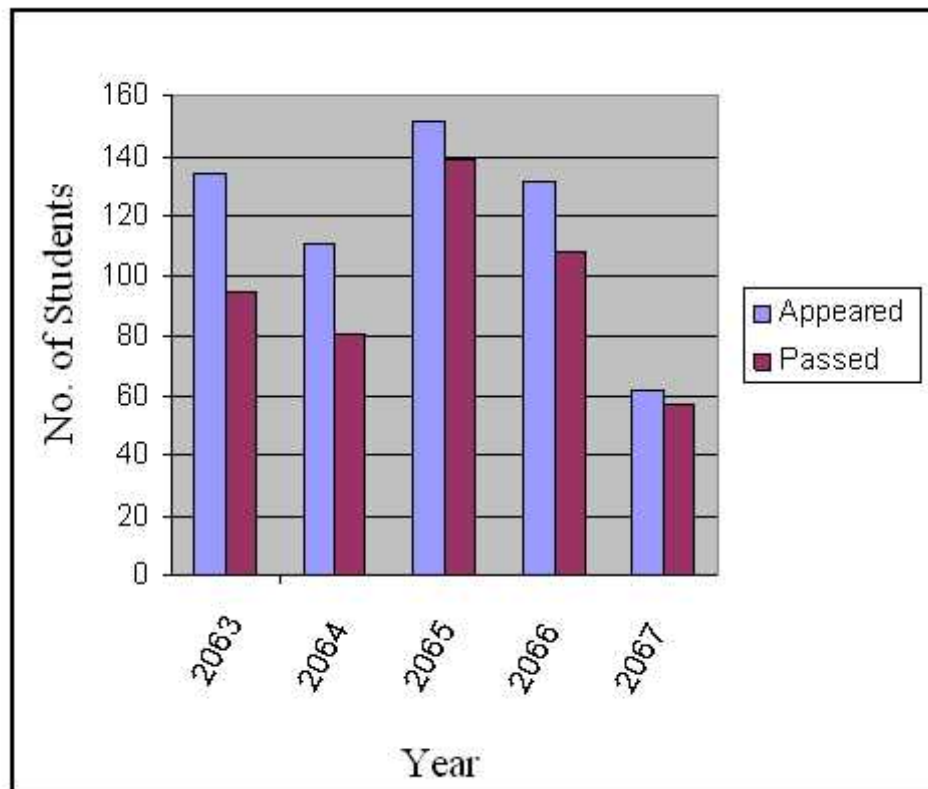
**Table 4.2 : SLC result of NJHSS  
(Year 20063 through 2067)**

Year	No. of Total students				No. of students in Opt. Math		
	Appeared	Passed	Failed	Passed %	Appeared	Passed	Passed %
2063	134	94	40	70	29	29	100
2064	111	81	30	72	15	15	100
2065	152	139	13	91	31	31	100
2066	131	108	23	82	29	29	100
2067	62	57	5	91	23	23	100

**Source: NJHSS, 2068 BS Shrawan, Tilahar X**

Table 4.2 shows that the result of 2063 BS is the lowest that is 70%. The result of other years is high. The result of optional mathematics seen better that is 100% whole result took from the Ledger of school; researcher found that the marks obtained by all students in optional mathematics were best.

**Fig.4.3:Bar diagram of SLC result from 2063 - 2067**



"Most of students are not regularly class attempt. The school need to filter weak students in SLC sent up exam. But by the pressure of parents, school had to send up all the students for the SLC exam".

(Head teacher X)

"I can't agree to the fact that students weak in optional mathematics due to topic vectors only. There are some other reasons behind it; that are irregular class attempt of students, poor base of students in mathematics. Lack of practices, and bad image of students on mathematics. I have not any facing problem to teach vectors. But, there becoming some trouble at teaching vector geometry because most of the students have weak concept in geometric theorems and we have to prove such geometric theorems by vector method"

(Teacher X)

Fig. 4.4 : Time Series of SLC result from 2063 - 2067

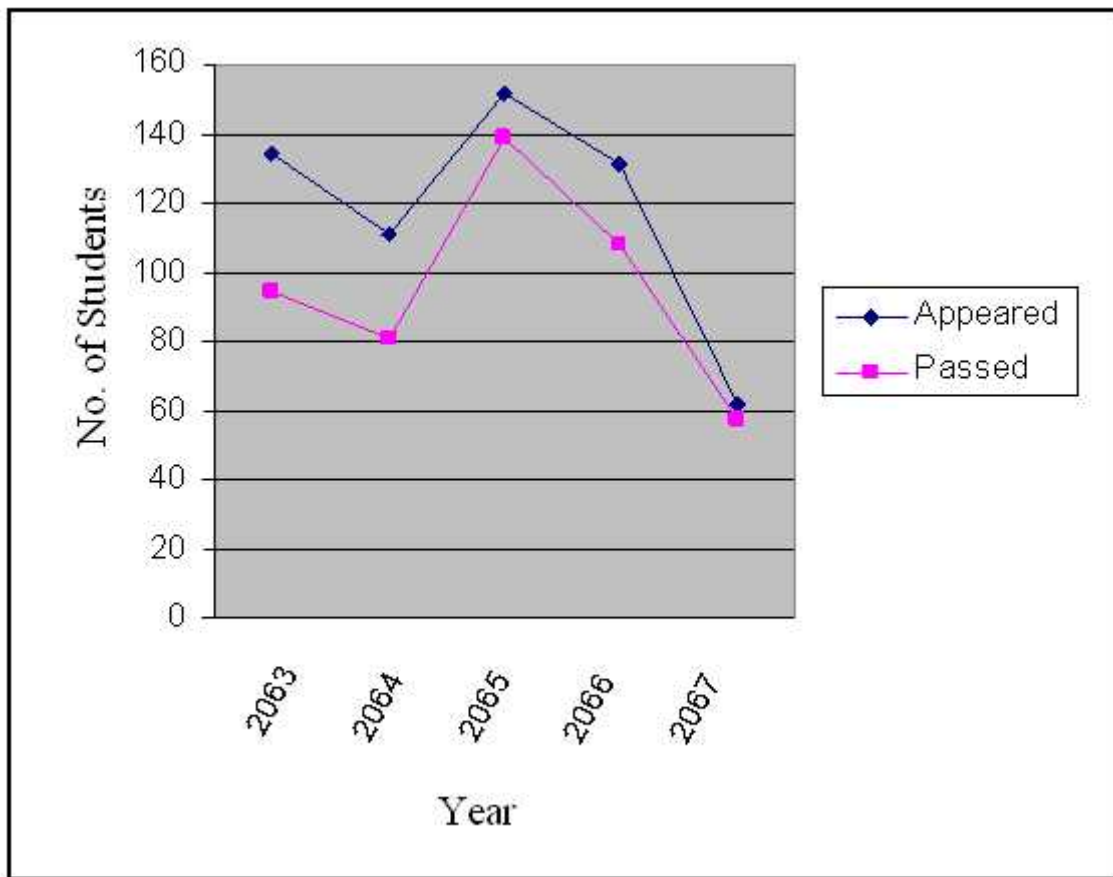


Table 4.2 shows that SLC result of every year is fluctuating during the study period.

#### 4.1.4 Students' Relation with Teachers and Others

In teaching learning environment the relation done by students with teacher and other friends is a major factor of learning environment. Teacher should be obedient, punctual, patience and should present good behavior to all students. Also students should be obedient, punctual, dedicated with teachers, friends and parents. Teacher should play role as an instructor and show the path to solve the problems and student should follow that. Teacher always thinks positively to students and students should receive it positively without any hesitation; that are ultimately shows the relation of teacher and students.

One episode is presented below focusing on the relation of students with teachers in school.

## Episode: 1

One day researcher went to school X with readiness to take class observation. Researcher reached in school at time of praying. All the students standing in ground as house wise. Boys and girls were studding separately. All the teachers were involved to arranging the lines of students. One teacher conducted assembly as code language and students performing them. After finishing the assembly two boys went to the stage. Peon played the national song in sound box and all the students follow that. At this time all the teachers were also standing in from of students' line face to face. After finishing the pray all the students went to own class room by swinging hand through line. Researcher and all the teachers also went to office room. Peon rang the bell. In second period researcher and mathematics teacher with chalk, duster and textbook went to class. All students stood up and said good morning sir. The teacher also said good morning and sit down. Teacher told today we learn new chapter i. e. vector unit. Teacher wrote the topic on black board and told open book to all students and read first paragraph of this unit. Giving the example of vector quantity and scalar quantity; define the terms himself. To identify vector quantity and scalar quantity teacher gave many more examples to students. One example was "supposed point M denotes Parbat and point N denotes Pokhara. A bus runs form Parbat M to Pokhara N in the east direction; and covered 67 km distance. At their distance from M to N is scalar quantity and the displacement of bus from M to the east side N is vector quantity. And it denoted by  $\overrightarrow{MN}$  . The arrow ( $\rightarrow$ ) denotes the direction of the line segment form M to N".

$$M \xrightarrow{67 \text{ km in the east}} N$$

distance + direction = displacement

Hence, the physical quantity having both magnitude and direction is called vector quantity and the physical quantity having only magnitude is called scalar quantity. Teacher asked question to students, is it vector quantity or scalar

quantity; in case gave wrong answer, teacher corrected it himself. Also teacher gave the introduction about vector representation with directed line segment and angle bearing of an object. Teacher write a question to represent it in vector as directed line segment and asked question to the students by calling particular name among the class. In this ways teacher define other terms that was magnitude of vector, sum of vector etc and repeat the above process. At the last of the period teacher gave home work to students. "

The above observation shows that the learning environment of class time and non- class time of school is peaceful. The teachers' team is also look very active at time of assembly. The class room environment is very quite. The behavior presented by teacher to student is positive in class room. And students show respectful behavior to teacher.

In the class room there are 14 students; 5 boys and 9 girls. The class room is multi - cultured, different ethnicity but homogeneity in learning power. The other factors of classroom management such as no. of desk, bench are sufficient; position of blackboard is appropriate. But teacher mostly use lecture method at the time of teaching, less use of blackboard, not used any material etc.

"We have good environment among teachers team. All are helpful to peers friends; In case any trouble becoming in subject matter, we solve it by discussing with other teachers. Students are faithfully. "

(Teacher X)

The above view of teachers' indicates that they solve any type of trouble through internally with collage. Students are faithfully.

"When we are not doing home work teacher give simple punishment to us; but in the class room, teacher always encourage to us to learning"

(Student X)

According to students of school X, teachers are not angrily and not giving hard physical punishment to students, Teachers always encourage to learning.

"Here are two mathematics teachers. We have good relation and also positive relation among the teachers team. We solve the facing problem of subject matter through the suggestion of peers".

(Teacher Y)

The above quoted view of teacher shows the relation among the teachers family is positive. And the becoming subject problem is solved by the way of discussion, suggestion with friends.

Teacher provides friendly behavior to us. We are small group to read optional mathematics so class environment is also quite".

(Student Y)

The above view of students shows that there is good relation between teacher and students. Class room environment is also quite due to the less number of students in class room.

The environment of school also shows by the relation with parents and the people who involved with school society. Researcher took interviews with parents. They told about involvement to schools in this way.

" At the time of result publishing, head teacher invites we to receive mark sheets and we go in school. head teacher and subject teacher provide valuable counseling to us about the progress of child" .

(Parent X)

The above view of parent shows that they are receiving required counseling with good relationship and also indicates that there is parental involvement in school.

"We rarely involve to school; since I have lack of education. Sometime school invites to us but we are not participating in school due to farming".

(Parent Y)

The above view of parent indicates that there is not well parental involvement in school. Parents are also not interested to involve with school. They falls self dominated due to the lack of education.

Hence by reviewing the above views, it shows that there are positive relation among the students, teachers and parents. They present helpful behavior to each other. Teachers solve their becoming problems with suggestion of colleague friends. The parental involvement is not satisfactory in both schools.

In short, it is found that there is not any facing problem of teachers and students on vectors teaching learning due to the students' relation with teachers and others.

#### **4.1.5 Public images towards school**

The public images towards school are another aspect of learning environment of school. The feelings, attitudes, beliefs, expectation, values of society, parent and the people attached to school etc. shows the images towards school. The head teacher, teachers, students and parents are the members attached to school.

"We invite all the students, parents and the community of school in function of parents' day; but not more than half members are attempting the function. Also school shows the yearly progress report of school in that function and collect the suggestion for future plan from the community of school".

(Head teacher X)

The above view of head teacher indicates that school presents the yearly activities (schools' progress report ) to all the members of schools, and also collect the suggestion for future plan. The number of participating members in the function shows there is not well parental involvement to school.

"Only middle and lower classes families admit their child in this school due to economic crisis; also students admit in this school form the neighbor village. The feeling of community about school is neither good not bad".

(Head teacher Y)

The above view indicates that most of the students of this school are form middle and lower classes family. The public image towards school is neutral; it indicates also there is not well parental involvement in school.



"I think it provide quality education in compare of other government school. So I admit our son in this school. But I have a question that why the teacher of this schools' admits their son in private school; is this school not providing quality education? "

(Parents X)

The feelings of parents towards this school are positive. They believe it provides quality education in compare to the other government school. But it does not provides as quality as boarding school.

"We are not able to admit our child in Private Boarding School due to economic condition. I have read only three classes but I want my son may read more".

(Parents Y)

The above view of parents indicates that they admit their child in the school with great aim but they have economic crisis. It also indicates that if they have good economic condition, then they will admit their child in private school. It means they believe that this school is not providing quality education as boarding school.

"The rules and regulation of our school is bounded in system. The teachers usually finished course time, they are regularly classes attempting in time, and they are always encourage us for learning. So teachers are responsible to us"

(Students X)

The view of students indicates that all the teachers and students are followed the rules and regulation of school. Teachers are curious, responsible to students.

"As we fell our school provide quality education, the mathematics teachers teach well. Don't give hard physical punishment. But the school gained better result in compare to other school".

(Students Y)

The feeling of students towards school is positive. But they have question why not our school gaining good result in comparing to other school; instead of

qualified teacher and good environment of school. The above feeling, beliefs of schools community towards the school are satisfactory.

Hence, it is concluded that there is not any facing problem of teachers and students on vectors teaching learning due to the public image towards school.

#### **4.1.6 Environment of Home and Society**

Environment of home and society are depends on the location of home, behavior of family, economic condition of family, the nature of studying room,

The above view of parents indicates that they admit their child in the school with great aim but they have economic crisis. It also indicates that if they have good economic condition, then they will admit their child in private school. It means they believe that this school is not providing quality education as boarding school.

"The rules and regulation of out school is bounded in system. The teacher usually finished course in time, they are regularly classes attempting in time, and they are always encourage us for learning. So teachers are responsible to us"

(Students X)

The view of students indicates that all the teachers and students are followed the rules and regulation of school. Teachers are curious, responsible to students.

"As we fell our school provide quality education, the mathematics teachers teach well don't give hard physical punishment. The school gained better result in compare to other school".

(Students Y)

The feeling of students towards school is positive. To run smoothly, school must gained good image from the school community. For this purpose school should have to find fault of the schools administration and improve it immediately.

Hence, it is concluded that there is not any facing problem of teachers and students on vectors teaching due to the public image towards school.

## **4.2 Activities of Teachers' and Students' in Class Room**

Among the teacher, students and learning environment in class room; Teacher is the main agent for curriculum implementation. Students perceive most behaviors of teacher and impressed to teachers, so the role of teacher in class room is most important. The activities of teacher in class room are to guide student, create and facilitate the learning environment encourage, motivate, examples to achieve the objective of curriculum. The roles of students are to do the activities promoted by school curriculum and task given by teachers as performer in class room.

One class room observation of school Y for the activities of students' and teachers' in a class room practice is presented below.

### **Episode : 2**

The teacher entered the class room with daily uses materials chalk, duster and text book. All the students stand up and said good morning sir then teacher replied good morning and sit down. Teacher writes the topic. "Magnitude and direction of Vectors" in the top part of black board. Then teacher raised a question that "What is vector quantity?" to whole the class. One student replied the answer a other followed him as together. After that teacher own self define vector quantity and gave some examples related to it. Teacher proved that how to find magnitude of vector whose initial point and terminal point are given as co-ordinates by plotting the co-ordinate on graph board and describing each and every step of it. Teacher asked some steps to student at describing. And teacher him self solved an example of finding magnitude of vector. And teacher asked to students that do have any trouble to understand in any step of solution? One student raised question then teacher again explain the above solution. After that, teacher gave a problem to students. Also teacher was giving hints at solving the problem. Similarly, more two problems gave to students. When students make mistake teacher correct it in his copy in class room. Researcher looked not all students had solve that questions. When bell was ranged, teacher gave assignment to students and come out the class room.

The above class room observation shows that teacher is not active and not well prepared about vectors. The class is mostly teacher centered. Teacher used lecture practice method in class room teaching. Teacher doesn't use blackboard frequently. The mistake of students did not solve in blackboard. Less involvements of students in class room practice. Students did not ask question frequently with teacher. Teacher evaluates students by giving class work and home work only.

It is sought that the teacher faces problem in vector teaching at appropriate method, materials and examples. Teacher should relate the magnitude of vector with the distance problems of co- ordinates unit. But it was not found in class room teaching. Teacher should relate any new concept with already learned concept and present illustrations connecting with daily life problems as far as possible. But it was not seemed at class room teaching. Teacher should create environment to solve the problem and encourage student to define terms magnitude and direction of vector by giving appropriate hints. But teacher own self solve the problem in blackboard. So, it is seemed to that there is lacking of encouragement and motivation in class room teaching.

Constructivism tells that the role of students becomes pivot element in education where students perform some functions in order to get new knowledge. Similarly, the role of teacher is to create and facilitate the learning environment for the students. Whereas, the role of society is to evaluate the knowledge of students' received in the environment created by the teachers. If these roles are correctly perceived, then they must be translated in to the class room practices. So, these three distinct roles, which we consider very general as well as very important, are listed as students as performer, teacher as a facilitator and society as an evaluator that must be translated through methods of teaching.

From the above discussion, it is concluded that there is lack of teaching materials in vector teaching. The mathematics teacher always promotes lecture method in vector teaching. There is lack of participation of teachers and students at vector classes. There are few number of students in the class of Vector classes.

There are few number of students in the class of vector but teacher do not use child centered approaching and do not evaluates students work properly, which is also a problem of vector teaching. The causes of becoming above problems in vector teaching are teacher applied traditional teaching methods, not using materials, not using teachers' guide of vectors teaching, less participation at vector class and don't have formal training to teacher etc.

### **4.3 Required Pre-Knowledge of students For Vectors Learning**

The Knowledge and skill of mathematics is the regular on going process. In this process, the previous knowledge and skill are the source of improving current mathematics. In this sense, mathematics is to be taught by applying the former skill and knowledge. The concept (knowledge and understanding) that are helped to learn the new topic is pre- knowledge. Students should have the well concept of co-ordinates geometry, transformation, matrices. trigonometry and geometry etc. as Pre-knowledge for vectors learning.

"We studied vector in class eight. At there we studied magnitude, direction of vector and simple addition and subtraction of vectors. Also we know about trigonometric ratios and measure the distance between two points in co-ordinates".  
(Students X)

"Only a few number of students solved the geometry part in examination. Some students solved geometric parts with the memory work of rote learning".  
(Teacher X)

"Basic knowledge of students is most required not for only vectors unit also for other units. in vector there is to find column vector, direction of vector by using cosine angle but the topic trigonometry is in text book. So I think sequence of units of optional should be reconstruct and also the concept of vector should be put later on the concept of matrix.  
(Teacher X)

The above views indicate that pre knowledge of student played most important role in the learning of new concept.

"Most of the previous academic years, teacher taught geometry at the last session of the year. Due to the final examination, teacher finished the geometric part fast".  
(Students Y)

"Generally most of the students feel geometric portion of any topic is hard and so, we should by heart it. So the backgrounds of students are weak. Also, I faced trouble to teach vector geometry".

(Teacher Y)

From the above views, it could be seen that most of the students faced problem in geometric portion of mathematics. Due to the poor pre-knowledge and base knowledge of students' in geometric portion; teacher has also faced problem to teach vector geometry. The main serious problem of students is to the bad feeling towards geometry that; it is hard subject and we should be by heart the terms of geometry.

A major theme in the theoretical framework of Bruner is that learning is an active process in which learners construct new ideas or concepts based upon their current/ past knowledge. The learner selects and transforms information, constructs hypotheses, and makes decisions, relying on a cognitive structure to do so. Cognitive structure (i.e., schema, mental models) provides meaning and organization to experiences and allows the individual to "go beyond the information given" .

As far as instruction is concerned, the instructor should try and encourage students to discover principles by themselves. the instructor and student should engage in an active dialog (i.e., Socratic learning ). The task of the instructor is to translate information to be learned into a format appropriate to the learner's current state of understanding. Curriculum should be organized in a spiral manner so that the student continually builds upon what they have already learned.

Hence it is concluded that the students' pre-knowledge plays a most important role to mastery learning in the vector learning. So the scope and

sequence of optional mathematics should be reviewed by Curriculum Development center.

#### **4.4 Teachers and Students Characteristics**

The teachers' characteristics directly affect the students' outcomes. The character and students are the collaborator process. The characteristics of teacher indicates sound personality, qualified, language, regularity, punctuality, active and efficient, kind / practical (good coordinator), truthful/ unbiased, a good parent/friend / model / trainer / researcher, evaluator etc. In the same way students' characteristics indicates active and will, truthful, faithful, punctual, moral etc. Students should do daily homework, class work given by teacher, to observe teachers and students characteristics at vector class one episode is presented below.

#### **Episode:3**

"One day, teacher entered in class room with daily uses materials chalks, duster and text book etc. Teacher was in uniform but not all students were in uniform. All the students stood up and said good morning sir; then teacher told good morning and sit down. Teacher asked to students that all have done your home work. All students replied 'yes sir'. After this teacher opened text book and wrote the topic "Kinds of vector" in top of black board. Teacher asked question to one student that, what the formula to find magnitude of vectors is. Student stood up and replied "Yesterday, I was absent sir". Teacher repeated the same question to other students and they gave correct answer. After that teacher revised the terms of vectors that was taught in previous class. Teacher wrote the many examples of vectors and encouraged to students to find the differences among the figure drawn on black board. Teacher described the all types of vector and wrote the definition of column vector, position vector, unit vector, zero/null vector, equals vector and negative vector. At this time class was quite and all the students were writing in note copy but one students requested to teacher to go toilet and teacher send them. After finishing this ; teacher wrote a question that

"If vector  $\vec{AB} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ ; find the magnitude of vector?" only 50% students solved the question and showed to teacher. Teacher checked the solution in class room. Teacher solved the given problem in black board by explaining step by step. While teacher told to students to give home work only four students submitted home work. Then teacher abused students and come out form class room".

The above class observation shows that the teacher and most of students of school are in uniform. The language of teacher is good and he is qualified teacher having 18 years experienced. He is trained teacher. The behavior presented by teacher in class room is angrily while students do not have home work. Teacher did not give home work at the end of class in that day. It indicates teacher is not give home work daily to students. Students were not motivated by teacher. Students also cheat teacher i. e. in the beginning of this class while teacher asked to students about home work; all the students told that we have done home work. But at the end of this class while teacher begged home work form student; only four students submitted their home work. Besides case of emergency, teacher should not sent student to toilet at the time of teaching, but he sent.

Teacher mostly used lecture method at teaching. Only a few students interacted with teacher. Remaining students were only seen to black board. But class room environment was very peace. There were also seen that some students were discussed with friend about subject matter at the time of teaching.

"The most serious problem to students is not attempting class regularly and not doing properly home work every day. For this problem I think students should be responsible to her his duties and also his / her parents should be responsible to child".

(Teacher Y)

"Teacher doesn't check home work daily. Generally, after finishing one exercise; once teacher checks whole home work; teacher doesn't take unit



text of vector and other units also. We regularly come to school except illness".

(Students Y)

The above views indicate that there is the main problem of irregularity of students. Teacher does not check home work day by day. There is weak evaluation system. From the teachers; attendance register it is seen that the teacher attempts classes regularly. From students' attendance register it is seen that the teacher attempts classes regularly, but some students are not coming regularly.

#### **4.5 Teachers' and Students' Attitude, Belief, Interest on Vector**

Influencing the students' action are the students attitudes or beliefs about themselves as learners of mathematics and their beliefs about mathematics as a discipline of students' confidence in their ability to learn. Teachers' attitude and interest on vector is influenced by the teachers' knowledge of content being taught, how students might learn or understand their particular content, and methods of teaching for that particular content.

The feelings, attitudes, concepts (knowledge and understanding), beliefs, expectation, value of vectors, relation of vectors with other mathematical units are shows the attitude, belief and interest on learning vector unit or teachers and students.

" It is interesting units; we want to read vectors unit. It is useful for further learning".

(Student X)

When researcher asked the question that how you know it is useful to further learning? The students replied that,

"Our mathematics teacher told that when you read in higher classes with specialization mathematics it helps as base knowledge to read vector and other units of mathematics".

(Student X)

"Except vector geometry; all the remaining topics of vector are easy to understand. It will be better if the topic vector is taught from class seven- eight".

(Student Y)

When researcher raised the question that why you feeling vector geometry is difficult in comparing with remaining sub units of vector? The students replied that, "First of all, we have sound knowledge of geometry and we have difficult to prove geometrical theorem in compulsory mathematics; but in this unit we have to prove such theorems by vector method. Also we have to difficult to prove out of text books' questions".

"It is appropriate to study vectors unit in optional mathematics at grade IX and X ".  
(Students Y)

The above view of students indicates students are most interested to learn vector units in secondary level. They disagreed to exclude the unit vector from the curriculum of optional mathematics. Also their opinion is to assimilate the topic vectors in previous classes but the feeling of students to study vector geometry is difficult; due to not well concept about geometric portion.

"Teaching is very complex job. Usually it is difficult to generate new concept to students. It will better if the content such as matrices had been introduced before introducing vector in optional mathematics curriculum. But it is just opposite in current curriculum of mathematics".

(Teacher X)

"Vector is very essential concept in mathematics. It plays important role to study mechanics in higher education in the field of science and technology. So, the introducing vector in secondary level curriculum is good. But it could be easier to learn student if once revised the running curriculum" .

(Teacher Y)

The above views of mathematics teachers show that vector is an important topic for secondary level. It is also plays as pre- requisite course for the higher education. The running course of study of vector unit is very limited; so it should be extend with rearranging the sequence of subunits of vectors.

#### **4.6 Teaching Methods, Materials and Evaluation Technique Promoted By Teacher for Vectors Teaching**

Teaching methods and instructional strategies are the main ways for meaningful teaching and learning of particular topic. Teacher is the main agent of the instructional strategies. In class room activities teachers' and students has vital role for the use of materials. The method of teaching should be based on knowledge, understanding, skill and application. Evaluation is a process by which the values of an enterprise are ascertained. Evaluation is a process to measure the achievement, quality and behavior of the students. The participatory approach of teacher should be child centered in class room. And evaluation should be helped to provide feed back to students.

For evaluation teacher can use informal evaluation that are placement test, formative test, diagnostic test, achievement test, oral test, home work etc. and formal evaluation that are placement test, achievement test, monthly test, unit test, terminal test etc.

#### **Episode: 4**

"As usual teacher entered in class room with daily uses materials chalk, duster, all the students stood up and said good morning sir. Teacher told good morning and sits down. Teacher took a text book form a student and wrote the topic "Operation of Vectors". And define as the addition, subtraction and multiplication of two vectors are known as Operation of Vectors. Then teacher wrote the sub- topic "Multiplying a vector by a scalar". And showed some examples that how vector is multiplied by a scalar. After finishing this. teacher raised question to students that what is properties of parallel of two lines. All students replied correct answer together. Then teacher wrote the condition of parallelism of two vectors. At this time all the students were engaged to copping form black board.

After finishing that, teacher cleaned the black board and wrote one question form the exercise of text book and solved that question own self and order to students to see answer of this question from book. The problem was

about to find magnitude and direction of vector; also there was the use of addition of vectors. Teacher told to student that after copying this solution; solve one question form book. When students were busy to solving problem; teacher just stand in front of class and observed only the students of first bench. When student stopped his pen to write; teacher gave some hints to all student in black board. Only one student showed the solution to teacher. And other students were discussed with friends about solution of that question. Teacher again repeated the above hints on black board. Again teacher told to students to solve the next question by giving hints. At the end of this class; teacher gave home work form text book".

The above observation shows that there is lack of participatory approach of both students and teacher in class room; because teacher solved the solution himself without involvement of student. Teacher taught about parallel of two vectors but he did not give class work about this. So, there is lack of learning management also. Teacher ordered to student for looking answer; it means there are also lack or preparation and confidence of teacher. There is lack of diagnostic test and oral test.

But teacher told that

"Mostly I use child centered method at teaching. I initialize vector by using graph board. I take test after finishing this unit". (Teacher Y)

"I am not using any fixed teaching method for vector teaching; but my aim is to how children receive the knowledge, in that way I go. I initialize vector by discussion method with students. Our teaching is child centered".

(Teacher X)

There is contradiction on teachers' views and class observation. Teacher mostly use lecture practice method in vector teaching. Evaluate students by giving class work and home work.

According to policy statements of the NBPTS, accomplished teachers display a "readiness to work collaboratively," participate in "collaborative efforts to improve the effectiveness of the school," and "cultivate a critical spirit in

appraising the schooling". In modern senses, teacher should use the child centered method, co-operative and more collaborative learning in the class room teacher that makes more effectiveness of learning.

"Teacher doesn't use materials except geometry box and graph board at teaching. Teacher doesn't take unit text". (Student Y)

"Teacher sometimes takes class test. School administration conducts mid-term examination at the time of between two terminal examinations for each subject and final exam at the last of the session. "

(Student X)

The above view of students shows that there is lack of teaching materials. Due to poor evaluation system; students did not have feedback and suggestion to improve in learning.

The analysis shows that the problems on vector teaching learning are lack of teaching materials such as teachers guide book and instructional materials, lack of learning management in class room, lack of explanation of terms such as parallel vectors, addition, subtraction of two vectors and vector multiplied by scalar quantity. Not giving feedback and suggestion to improve in vector learning.

The causes of becoming above problems are; not well participatory approach of both students and teacher in vectors teaching at class room, lack of preparation and confidence of teacher about the vector manipulation, lack of diagnostic test and oral test. Teacher mostly uses lector method in vector teaching. Evaluate students by giving class work and home work. The introduction about operation of vectors such as law of vector addition and law of vector multiplication and required diagrams are limited in text book.

## CHAPTER V

### SUMMARY, CONCLUSIONS and RECOMMENDATION

#### 5.1 Summary

In the mathematics class there are different students. They are differ from one another in terms of intellectual difference, achievement difference, different family environment cultural and ethnic background educational factors etc. This is the case study about facing problems by teachers and students on vectors teaching-learning of secondary level. It is qualitative research as well as descriptive in nature. The main objective of this case study is to identify the problems on vector teaching learning and the cause of problems on vectors teaching - learning faced by teachers and students. For this purpose researcher selected only two government school one form urban area and other from the rural area as case schools of Parbat district. The respondents are mathematics teacher, students, head teacher and parents. The tools used in data collection procedure are class observation, face to face interview and recorded history about schools.

Both of schools don't have sufficient mathematical materials for vector teaching and also lack of protection of available materials for future use. The causes of becoming problems are economic crisis of administration to add materials for vector teaching, and not available separate place to store materials. Most students leave the vectors questions in examination. Lack of practice for learned topics. The reasons behind those problems are; students and teachers are not using extra books beside the text book prescribed by CDC. Due to lack of good concept of geometry to students, there is a problem in teaching learning of vector geometry.

Both schools have better SLC result of optional mathematics in study years. Due to the poor pr-knowledge and base knowledge of students' in co-ordinate geometry, trigonometry and geometry; teacher has faced problem to

teach vector geometry. Most of students have faced problem in geometric portion of mathematics. The main cause of students is the bad feeling towards geometry, that; it is hard subject and we should by heart the terms of geometry.

The causes of becoming problems are not well participatory approach of both students and teacher in vectors teaching at class room, lack of preparation and confidence of teacher about the vector manipulation, lack of diagnostic test and oral test. Teacher mostly uses lector method in vector teaching. Evaluate students by giving class work and home work. The introduction about operation of vectors such as law of vector addition and law of vector multiplication and required diagrams are limited in text book.

## **5.2 Conclusions**

- ) Giving lecture and using chalk and board only may not help average and below average students to understand mathematical concepts of vector in normal class.
- ) The problems are becoming on vectors teaching learning due to students' weak pre- knowledge about vectors and poor geometrical background.
- ) Both trained and untrained teachers promote traditional teaching strategies in vectors. Teachers do not access modern teaching techniques, methods and materials at vectors teaching.
- ) Vector learning seems to be exam oriented rather than practical oriented or its application. Lack of students' project works on vectors learning.
- ) Most of the students have less interest towards vectors learning Vector being an abstract subject matter and also, it is a new concept; so it is difficult to create interest on students.
- ) Due to poor evaluation system, careless of schools' administration and non- effective learning management; both teachers and students faced problems on vector teaching-learning.

### **5.3 Recommendations and Suggestion for further study**

- ✎ School administration should provide opportunities to the teachers to enhance their commanding over subject matter pedagogical knowledge.
- ✎ More Counseling should take place between the teachers and students.
- ✎ Integration of resources with physical planning should be more effective to maintain quality education.
- ✎ Teacher should continue to invest in project work for vector teaching.
- ✎ Teacher should be prepare strategy for the problems faced by students and teacher in teaching - learning vector with vector teaching materials.
- ✎ This study was conduted using small sample thus the finding of the study colud not be generalize in the broad sense. Thus, it would bne more valueable it the study would be done with covering broad areas.