

DETRIMENTAL FACTORS OF LOW ACHIEVEMENTS IN GEOMETRY

**A
THESIS
BY**

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Letter of Approval

A

Thesis

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Entitled

“Detrimental Factors of Low Achievements in Geometry” has been approved in partial fulfillment for requirements of degree of Master of Education.

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Letter of Certificate

This is to certify that Mr. **Jhalak Prasad Adhikari**, a student of academic year 067/68 with Campus Roll No. 795, Thesis No. 1010, Exam Roll No. 281401 and T.U. Registration No. 9-2-278-1079-2006 has completed this thesis under my supervision for the period prescribed by the rules and regulation of Tribhuvan University, Nepal. The thesis entitled “**Detrimental Factors of Low Achievements in Geometry**” embodies the result of his investigation conducted during the period of 2015 at Department of Mathematics education, University campus, Kirtipur Kathmandu. I recommend and forward this thesis for the evaluation as the partial requirements to award the degree of Master of Education.

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Jhalak Pd. Adhikari

ABSTRACT

Geometry is one of the important aspects of mathematics. Research findings have shown difficulty in teaching and learning of mathematics, Geometry in particular. Not only the geometry most of the students are suffering from the confusion of the basic concept of the mathematics.

So, this is a case study to identify the detrimental factors for low achievement of geometry and its remedial measure. This Study was conducted on Grade – VIII of Nightingale School, Kupondol, Lalitpur. Two teachers and six low achiever students of Geometry were selected as the respondent units. The school documents, classroom observation and interviews with students, teachers and parents were the tools of study. The major findings of the study were identified such as foundation of the instructor and the learner is not in the level of satisfactory. Students have poor generalization power in Geometry and interest of the students to improve their level is no more towards Geometry. Lacking on the willingness to learn new concept in Geometry and searching new teaching techniques, material related aspect and the evaluation tools. In our context we must give emphasis of geometry learning. In the similar manner contextualisation of learning and change from the traditional one-way classroom to two-way interactive classrooms is required to change the level of Geometry in school level.

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LIST OF ABBREVIATIONS

CERID: Research Centre for Educational Innovation and Development

FGD: Focus Group Discussion

ICT: Information computer and Technology

SLC: School Leaving Certificate

ZPD: Zone of Proximal Development

Chapter I

INTRODUCTION

Background of the Study

The word 'Geometry' is taken from the two Greek words 'Geo' and 'Metron' and Geo - meaning earth and Metron - meaning measure. Geometry was extremely important to ancient societies and was used for surveying, astronomy, navigation, and building. Geometry is an aspect of mathematics which deals with the study of different shapes. These shapes may be plane or solid. A plane shape is a geometrical form such that the straight line that joins any two points on it wholly lies on the surface. A solid shape on the other hand is bounded by surfaces which may not wholly be represented on a plane surface (Battista, 1999). Geometry is the study of angles and triangles, perimeter, area and volume. It differs from algebra in that one develops a logical structure where mathematical relationships are proved and applied. According to Oxford Dictionary this is the branch of mathematics concerned with the properties and relations of points, lines, surfaces, solids, and higher dimensional analogues.

In the field of teaching and learning mathematics the geometry is the one of the important aspect. Statistics have shown difficulty in teaching and learning of mathematics, Geometry in particular, has resulted in mass failure in examinations. The mass failure in mathematics examinations is real and the trend of student's performance has been on the decline. In my career of teaching and whole the student life I have taken the geometry as most challenging subject (Houdement, et all 2003).

There is a major problem in the field of geometry instruction created by the different aspects. Mainly the foundation of most mathematics teachers in geometry is poor (Adolphus,

2011). Most of research has indicated that in our context the teaching and learning process is very critical. The present day teaching of geometry is far from being satisfactory. Everybody has a complaint against the teaching of geometry. It is dull, boring difficult and useless from the point of view of the learners. It is too remote from interest on students (Sidhu, 2002).

Furthermore, describing the real reason of the failure in geometry, Butler & Wren (1965) writes, there is however, good reason to believe that in most cases that real reason for much of the failure in geometry and apathy toward the subject lies mainly in poor motivation and failure to provide clear insights into the meaning and method of the subject. Probably much of the unsatisfactory work in geometry, and the dissatisfaction with which students view the subject, can be traced to the fact that it has not been taught to them in such a way as to excite their curiosity and present them with an intellectual challenge but as a rather dull job to be done. Supporting this idea CERID states that “most of the teaching in secondary school consists of lecturing, rote memorization and group reciting. The causes of the most of these are connected with lack of training among the teachers, large class size in urban areas and poor physical facilities in rural school (CERID, 1988).

Learning geometry may not be easy, and a large number of the students fail to develop an adequate understanding of geometry concepts, geometry reasoning, and geometry problem solving skills (Battista, 1997). The lack of understanding in learning geometry often causes discouragement among the students, which invariably will lead to poor performance in geometry. A number of factors have been put forward to understand why geometry learning is difficult – geometry language, visualization abilities, and ineffective instruction (Cangelosi, 1996). Poor reasoning skills are also another area of concern among secondary school students. Many are unable to extract necessary information from given data and many more are unable to interpret

answers and make conclusions. Traditional approaches in learning geometry emphasize more on how much the students can remember and less on how well the students can think and reason. Thus learning becomes forced and seldom brings satisfaction to the students.

School-mathematics-curricula of Nepal have given emphasis on geometry learning from the beginning of schooling. There are mainly three issues in teaching and learning geometry in reference to Nepalese Schools. These are: emphasis on learning geometry, contextualisation of learning geometry and change from the traditional one-way classroom to two-way interactive one.

Regarding an emphasis on learning geometry the secondary school curriculum has mentioned the four strands of learning such as knowledge, application, problem solving and comprehension. “The knowledge strand” requires the learners to know definitions, facts and formulae and the emphasis of “application” is on transfer of learning into a novice situation. The “problem-solving strand” aims at developing an exposure of use of geometry to solve the day-to-day problems and the fourth strand aims at developing comprehension of geometric concepts, their relationships and structure.

While talking about the emphasis on teaching and learning geometry, the curricular objectives are still insufficient to address the two aspects of the changing context. Firstly, the curricula do not have a focus on “communication”. According to the National Council of Teachers of Mathematics, importance and use of communication in mathematics classroom, is necessary to increase students' reading, writing, discussing, representing, and modelling mathematics, because, when students communicate their ideas, they learn to clarify, refine, and consolidate their thinking (Perry, 2001). Secondly, the curricula also lack an emphasis on

“spatial reasoning”. Spatial reasoning helps develop the understanding of everyday applications, for example, giving and receiving directions and reading maps, understanding of two and three dimensional objects, working with coordinates and graphing (Lindquist & Clements, 2002).

The second issue of geometry learning is contextualisation. The term “contextualisation of learning” infers that learning can be promoted by meaningful contexts and relating instruction to the real-life situation. The learning in Nepalese schools is totally based on textbooks, which have been prepared according to the school curriculum. On the one hand, since the textbooks have been written in formal Nepali language, it is difficult for those students who have other language-speaking background than Nepali-in Nepal different local and ethnic languages are spoken for example, Newari, Maithili, Gurung, Rai, Limbu, Tamang, Sherpa and Magar. On the other hand, the teachers use the textbook as an ultimate means of teaching that does not provide the opportunity of relating their learning with local context.

The third issue is related to the ways of teaching. In most of the Nepalese schools students have less chance to interact with their peers and teachers. They have to listen to the teachers’ idea. The crowded classroom is one of the major problems of implementing interactive teaching and learning situation. Of course, an interactive classroom should provide opportunity to the students to talk, to question, to present their ideas. Regarding interactive mathematics classroom, Alper et al (1995) have mentioned as: “All the desks are turned to face each other. The students are writing with felt-tipped markers on butcher paper. They are looking at one another’s graphing calculators. The teacher is nowhere to be seen. Oh, there he is, sitting down with one of the groups. A student has walked away to from her group to confer with another group. She never asked for permission.” (Alper, Fendal, Fraser, & Resek, 1995)

Before dealing about other I really convinced by that Nepalese school is facing the problem of low achievement in geometry. Not only the geometry most of the students are suffering from the confusion of the basic concept of the mathematics. Poor achievement means none other than the low achievement in geometry. It means below the standard score.

Statement of the Problem

In the teaching and learning of mathematics personally I have felt too difficulty for its application and comprehension. Being a mathematics teacher I never been satisfied by myself towards my teaching on the geometry. Especially while we see the unseen different theorem and different verification type question we can't get any ideas to teach and even for its proper solution method. Also my colleague of mathematics has share same problem in the teaching geometry and its different concepts. The poor performance of students in mathematics and geometry in particular has been a thing of concern to mathematics educators, parents and government. The S.L.C. exam annual reports in mathematics are good testimonies of those facts. Mathematics educators have put in effort aimed at identifying the major problems associated with secondary school mathematics. Despite all these noble efforts, the problem of poor achievement in mathematics has continued to rear its head. It is based on this fact that this research identified geometry as a core difficult area where student's performance has always been low. Basically this research had tried to answer the following research questions:

- What are the detrimental factors for low achievement of geometry?
- How can the low performer be promoted?

Objectives of the Study

The objectives of this study are:

- I. To identify the detrimental factors for low achievement of geometry?
- II. To find out the strategies taken by teacher to improve achievement on geometry.

Significance of the Study

This study is completely aimed to find those factors that are related to the difficulties in the instruction of geometry. Not only to point out the factors; it will also suggest the ways to minimize the problems and what to be done this aspect. In the field of mathematics education this research is a step to analyze the effective way of instruction strategies and to take the action over its obstacles. Nowadays mathematics especially geometry is the most hazardous to learn and teach. Thus in this circumstances my study is a supportive documents to teach maths and geometry in the effective and productive manner. This study may be fruitful to concern individual for the following aspects.

- To provide a database relating to teachers problems in teaching geometry.
- To make appropriate instructional strategies to teach Geometrical concept.
- To make a favorable curriculum for the geometry.

Definition of the Terms Related to the Study

Institutional School

The schools which are established by the individual or by the community and do not receive regular government logistic and financial support.

Secondary school mathematics teachers

The teachers who teaches mathematics at Secondary level.

Poor Achievements

The achievements which is unable to meet the minimum requirements or simply below the standard score.

Standard Score

The minimum score which is require passing the level. Like the minimum score is 32 for the full marks 100 at S.L.C.

Stakeholders

Those persons who are related to school directly or indirectly. Specially, here on this research Head master of the school, Subject teacher, parents of the respondent students are the Stakeholders.

Delimitation of the Study

Every study has limitations. The study had been conducted within the given time frame and financial limitations. This was a research work mainly conducted for an academic purpose based on the information from primary sources and suffered from certain limitations that covers:

- The researcher had selected the study area in accordance with researcher's convenience so the result of the study can be no more generalized.
- This was only a micro level study on geometry teaching at Nightingale H. S. School of Lalitpur.
- Due to the time and resource limitation, the case study had conducted only Nightingale School. Thus, the generalization made in this study may or may not represent the country as a whole.
- The success story that had been cited in this study may or may not represent the total scenario of the extent of study of instruction.

Chapter II

REVIEW OF THE RELATED LITERATURE

The review of related literature deals with the theories of research studies which have been conducted earlier. It helps to conduct the new research in systematic manner by providing the outline of the research study and avoid the unnecessary duplication. Review of related literature is an essential part of research for the researcher because literature helps and guides research to meet theoretical way for the study. Literature provides authentic and strong knowledge. Mainly the literatures are previous thesis, books and journals; different sources use to site literature. To make the research effective and truly new Researcher had studied the different research found in the Mathematics education Department. On his topic Researcher has found some of the research which just indicates the problem but Researcher had tried to research on the strategies that can be taken as a remedial tools. In this regard the following were the related literature in this study.

Empirical literature

Luitel (2005) on his Dhulikhel Experience states that there are mainly three issues in teaching and leaning geometry in reference to Nepalese Schools. These are: emphasis on learning geometry, contextualisation of learning geometry and change from the traditional one-way classroom to two-way interactive one. Firstly, the curricula do not have a focus on “communication”. Importance and use of communication in mathematics classroom, is necessary to increase students' reading, writing, discussing, representing, and modelling mathematics, because, when students communicate their ideas, they learn to clarify, refine, and consolidate their thinking. Secondly, the curricula also lack an emphasis on “spatial reasoning”. Spatial reasoning helps develop the understanding of everyday applications. The second issue of

geometry leaning is contextualisation. The term “contextualisation of learning” infers that learning can be promoted by meaningful contexts and relating instruction to the real-life situation. The learning in Nepalese schools is totally based on textbooks, which have been prepared according to the school curriculum. It is important to identify the extent of contextualisation of the curricular contents. The third issue is related to the ways of teaching. In most of the Nepalese schools students have less chance to interact with their peers and teachers. They have to listen to the teachers’ idea. The crowded classroom is one of the major problems of implementing interactive teaching and learning situation.

Chaulagain (2005) had indicated on his research “A Study of problems Faced by Secondary School Mathematics Teacher in Teaching Geometry” geometry teaching and learning activities in Kathmandu district is not satisfactory level. It was the survey among the government and privet school teachers. Among the 30 teachers questionnaire had presented and asked them to give their response on different questions. He had made the conclusion that most of the teachers are facing the following problems: a). Students’ evaluation techniques; b). Geometry instruction; c).Teachers professional development and d). Constructing and using instructional materials, students’ background and curriculum related factors.

Adolphus (2011) had done a research with the topic "Problems of Teaching and Learning of Geometry in Secondary Schools in Rivers State, Nigeria." It has been the survey among the 300 students and 30 teachers of 10 government schools. Questionnaire had given to the respondent to collect the information and it had been analyzed by the using the Likert Scale. His some of the findings that emerged first is the foundation of most mathematics teachers in geometry is poor and second is the students have poor foundation in mathematics. Similarly third is the teaching

and learning environment is not conducive. Based on the findings, it was recommended that (a) The State government should as a matter of urgency send mathematics teachers for training and seminars for effective teaching and learning. (b) The government should endeavor to provide the necessary infrastructures and facilities that will motivate teaching and learning of mathematics.

Bhatta(2011), conducted the research on “Causes of Failures in Maths at Grade- VIII”. For the study of this case he did survey with using the tools questionnaire, FGD and interview among the 40 failures students of Kavre district. His conclusion was different variables like teachers training, home environment, socio-economic status of family, material used in teaching learning activities are responsible to this less achievement in maths.

Pande (2008) did his thesis on “Causes of low Achievement in Maths” at Rupandehi district. It was a case study of six students of Nayagaun secondary school, Butwal. By using the school documents, observation note n interview he made the conclusion that traditional type of teaching is one of the major cause.

Neupane (2006) conducted the research on “Effect of Socio-economic Status on Maths Achievement”. For this study the researcher had developed the achievement test paper, parent’s questionnaire form and 84 sample student of grade III from five different government school’s of Lamjung. The conclusion of the study was there is significant correlation of Socio-economic status and mathematical achievement.

Theoretical literature

This chapter deals the theoretical discussion which is needed for the interaction of the finding of the study. Many theories have been developed about the children learning and development, some are cognitive, some are behaviorist, and some are humanist while the next is social learning theory and so on. In my research I have used ‘The van Hiele levels’.

Pierre Van Hiele and Dina Van Hiele-Geldof developed a series of thought levels that they perceived as describing a progression of increasing sophistication of understanding of geometry. Initially, five discrete hierarchical levels were described, numbered 0-4; variations on these levels continue to provide the basis for many models used to understand learning in geometry. In recent years the original five levels have more commonly been renumbered as levels 1-5 (Swafford et al., 1997), and many researchers have described the existence of an earlier, pre-recognitive level (Clements and Battista, 1992). It is this more recent numbering that will be used in the following discussion.

Thought Levels

According to the van Hiele model it is not possible for learners to bypass from their level of thought. They cannot see what the teacher sees in a geometric situation and therefore do not gain from such teaching. On their study they developed the level of thought which are as below.

Level 0: Pre-recognitive

At the pre-recognitive level students cannot reliably distinguish between different classes of figures. For example, while they may be able to distinguish between squares and circles, they may not be able to distinguish between squares and triangles.

Level 1: Visual

At the visual level students recognise figures by their global appearance, rather than by identifying significant features, for example a rectangle would be recognized as a rectangle “because it looks like a door”. Some researchers (Clements et al, 1999) believe that this level can be better described as syncretic, as students at this level often use a combination of verbal declarative and visual knowledge to differentiate between shapes. That is, at Level 1 some children may apply a combination (synthesis) of overall visual matching with limited feature analysis to identify shapes.

Level 2: Descriptive/Analytic

At the descriptive/analytic level students differentiate between shapes by their properties. For example a student might think of a rectangle as a shape with four sides, and label all shapes with four sides as rectangles. However they might refuse to accept a square as a rectangle “because it is a square”.

Level 3: Abstract/Relational

At the abstract/relational level students relate figures and their properties. They can provide definitions, and differentiate between necessary and sufficient conditions for a concept. They can classify figures hierarchically, and produce some geometric arguments.

Level 4: Formal deduction

At the formal deduction level students develop sequences of statements that logically justify a conclusion; constructing simple, original proofs.

Level 5: Rigour

At the final level, students rigorously apply rules to derive proofs within a mathematical system.

Phases of Learning

As well as the levels of understanding the van Hiele's also described 5 phases of learning through which students can be taken in advancing to the next level. According to their level of thought students have their own level of learning..

Phase 1: Inquiry

In this phase the teacher engages the student in two-way conversation about the topic. Vocabulary is established and the teacher sets the ground for further study.

Phase 2: Directed orientation

Here the teacher directs the path of exploration in such a way as to ensure that the student becomes familiar with specific key ideas related to the topic.

Phase 3: Expliciting

Now the students work much more independently, refining their understanding and use of vocabulary.

Phase 4: Free orientation

In this phase the students encounter multi-step tasks with no one route to solution, and explore their own methods to obtain solutions.

Phase 5: Integration

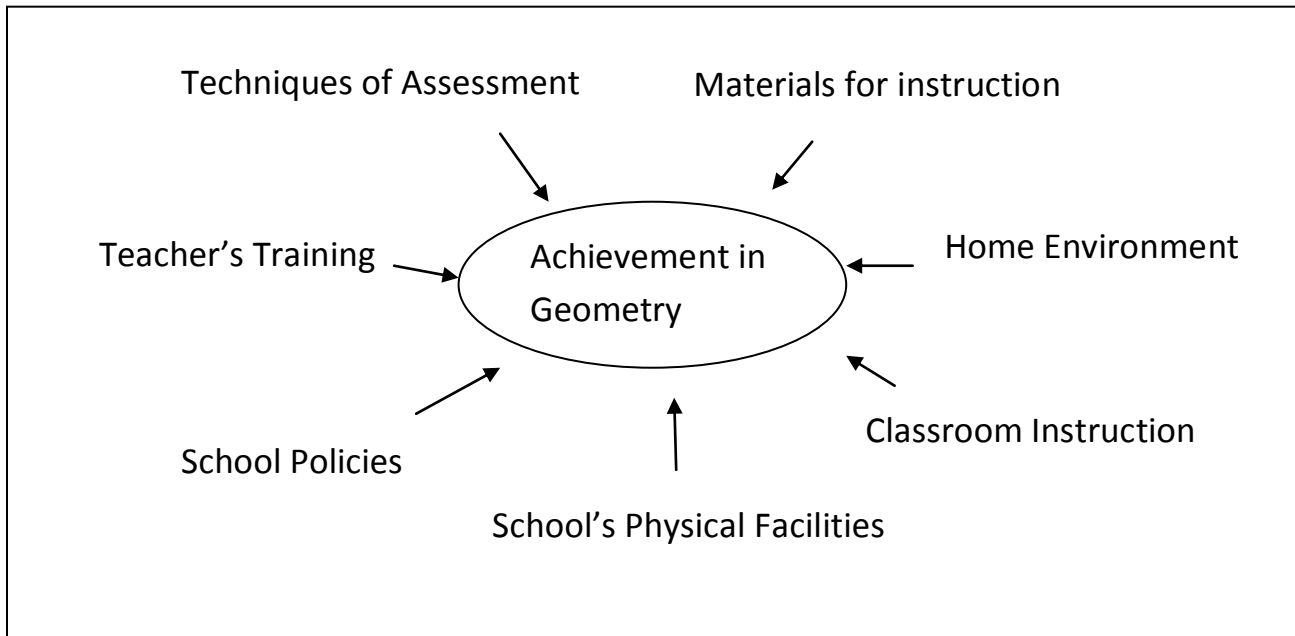
Finally the students review their learning and produce an overview of their understanding. The teacher aids them in summarizing their key ideas.

Geometry taught in elementary level should be informal. Such informal Geometry activities should be exploratory and hands-on, in order to provide children with the opportunity to investigate, to build and take apart, to create and make drawings and finally to make observations about shapes in the world around them. This provides the basis for more formal activities at higher levels (Van Heile, 1986). Students fail to reach the descriptive level of geometric in part because they are not offered geometry problems in their early years. It appears that there is a long period in which geometry is ignored, resulting in 'Geometrically deprived' students. Diagnostic assessments will help to determine the developmental level of geometry for each student. So this theory has been used on this study of the determining factors of geometry.

Conceptual Framework of the Study

The conceptual understanding is established on the basis of research topics. The main target of the study was to identify the detrimental factors of low achievement in geometry. So this had deal under what points my research is concerning. The diagram speaks itself about it. This is the complete map of my study depending on the study "Problems of Teaching and Learning of Geometry in Secondary Schools in Rivers State, Nigeria"(Adolphus, 2011).

Achievement in Geometry and Variable Related to it



The different research and investigation has shown that the learning is affected by different variables. The knowledge gained by students can differ as the presence of facilities, school and family environment, teacher's perception & training, evaluation techniques etc. students needs more support or scaffolding to get the optimum level of the knowledge as they have the ability to get it. So my research was under these circumstances.

Chapter III

RESEARCH METHODS AND PROCEDURES

Methodology plays the vital role in research. The methods and design is the main guidelines for the researcher. Research methodology presents the logical way of study because it determines how the research becomes complete and systematic. This is a case study so the researcher had followed qualitative method. Qualitative research is a form of inquiry that explores phenomena in their natural setting and uses multi methods to interpret understand explain and bring meaning to them.

Qualitative research involves the studies and collection of a variety of empirical materials- case study, personal experience, life history, interview, observation, historical interactional and visual texts- that describe routine and problematic moment and meaning in individual's lives are its tools for data collection. Since the qualitative research is about person's life, stories and behavior, it is a non mathematical analytical procedure. The basis meanings of gathering data are observation and interviews including the field notes, documents, books, tape records, diaries and so on. The researcher had studied and explored the learning of geometrical concept and its achievement, so observation and interview had used. The following streams were my methodologies for the research:

Research Design

The design of this research was case study among School children and the stakeholders. This research was qualitative research as well as descriptive in nature.

Study Area and Rationale

The study was depending on the one of the popular institutional school (Nightingale School). Researcher is working at this institutional school in Lalitpur and he had found many

more problems on these school on the teaching geometry. Also before his study he hasn't found the research done in institutional school on this case.

Sample

Nightingale School, Kupondol is the case school. Out of the intuitional school in Lalitpur district it is one of those schools which are facing the low achievements. Researcher is working at this school and its is ground reality which he is facing in geometry. Since 4 years, this school has started the separate examination and concept of unique subject for Arithmetic and Geometry. The research was concerning to teaching and learning of geometry in secondary school. The respondent of the study were those students who were low achiever, mathematics teachers, department head of mathematics and related parents. Mainly the low scorer six students had taken from the grade VIII of this school, the math teacher of each Section were the respondent as per need.

Data Collection Tools

To collect the data for the case study I had take the different tools like School documents, observation notes, interview etc.

School Documents

All the required documents like student's achievement records, teacher's details, Mark's ledger, extra-curricular activities etc. were studied.

Observation Note

The data from observation consists of detailed description of the people activities, behavior, action and personal experience. The direct observation has the advantages of putting researcher into first hand contact with reality it is usually possible to observe only a small individuals of

groups. The observation note had prepared to observe classroom activity and environment. For this researcher had followed participatory observation. On the observation note mainly the points of Appendix-A was noted such as a). Facilities and structure of the classroom. b). Beginning of the class. c). Setting the learning stage. D). Acquisition of Learning. e). Collection of instructional materials and finally Completion of class/ lesson.

Interview Schedule

The interview consists of question to the children, Parents teachers and stakeholders about their experiences, opinion, feeling and knowledge. It also helps to understand participation perception or relation, views and ideas towards certain subject matters situation, context and phenomena by her/ his facial expression. So, at first researcher had taken informal conversation interview them used a set of open ended question to them. During the study there has been occurred formal and informal conversation among students, teachers and parents. Students were interviewed on the basis of Appendix-B and views collected about facilities of school; mathematics and geometry study; his/her achievements on geometry; his/her teacher and classroom practice and the causes of his/her failure on geometry. Finally they were asked about their external needs and his/her views on the education and its practice such that he/she can be promoted. Teachers were asked about same statements and research was interested to know their response on their own teaching learning activities. It had been done by with the help of Appendix-C. Similarly, parents of the respondent students were asked about similar circumstances and how their child can do better. Also the Head of Mathematics Department was interviewed according to Appendix-D. Main focus of the conversation was what the plan to improve the conditions is.

Primary & Secondary Data Sources

Data was quantitative as well as qualitative in nature. Both types of data were collected from them the field by using appropriate methods, techniques and tools of data collection. Primary data was collected from the field. Secondary data was collected from the published and unpublished documents like books, journals, bulletins, reports and papers of various organizations and institutions.

Data Collection Procedure

For the data collection procedure researcher had collected the data by visiting the Head of maths department and then making relation with maths teachers. Researcher had studied the ledger of the student of Grade -VIII and six low scorers had selected for interview. The different documents as mentioned above had studied properly. Classroom activities had observed as the teacher wants with all the required condition for continuous three week of Falgun - 2071. During these three weeks 10/10 class of both teachers had been observed and observation notes had written. The students and parents interviewed and the response had recorded with audio- visual device. Some of the open ended questions were asked to know their attitude and expectation from maths circumstances, about their experience, opinion, feeling and knowledge of mathematics.

Data Analysis

This is qualitative research, Hence the major part of data analysis was based on descriptive analysis. Qualitative research about personal life lives, experiences, behavior emotions, feelings, social movement as well as cultural phenomena and interaction between the nations. These data had been studied from as many angles as possible to use descriptive and interpretive form triangular analysis through teachers view, students view, class observation and

theory of geometry with coding the data on the basis of similarities and difference which was obtained from the class observation form, questionnaire and interview schedule.

The collected information from the class observations, interviews and schools' records were categorized according to the category of the respondents and their theme. The researcher had also tried to ensure the internal validity by observing the same phenomenon repeatedly to clarify his biases. As the conceptual framework deals all the components, analysis had been done by the triangulation method and constant comparison.

Ethical Consideration

Ethical consideration is most important issue for the research. Here researcher need to strongly ethical about this own work and for the respondents personal issues (yin, 2011). So, for data collection Researcher had never force his participants to give the answer. What answer he had got from them he had used these things for his research purpose. All information has been secretly maintained by him.

Chapter IV

ANALYSIS OF DATA AND INTERPRETAION OF THE RESULT

This chapter deals with the analysis and interpretation of the collected information. The researcher had minutely studied the schools' documents such as teachers' profiles, marks ledgers, attendance as well as the records of respondent students as per need. Researcher had observed the 10/ 10 classroom teaching learning activities of both the sample teachers of Grade – VIII. By the observation of the natural setting classroom teaching-learning activities observation note was prepared. On the observation note each key activities and its affect had mentioned. On the similar manner the researcher had visited the parents of sampled students to conduct the interview. To get the required information there were different conversation which was formal/informal both between the researcher- students; researcher-teacher and researcher- parents had occurred. Here researcher has used the method of triangulation and the constant comparison method to analyze the data according to the conceptual framework presented previously.

Introduction about Case School

Among the three district of Kathmandu valley Lalitpur is one of the districts. It is partially develop district. On this district here are many popular institutional schools located. Out of those popular schools, Nightingale Higher Secondary School, Kupondol is one where the research had taken place. It is in the prime location of valley. Near about the 4500 students are studying on this school. Among the institutional schools this school has very impressive results. During 4/5 years, it is facing the low achievements in geometry. Most of the teachers in the foundation level of schooling are non- education background. Same condition is there for secondary level though they are one of the experienced and awarded teachers. Teachers are partially engaged in

teachings who are working on lower level but the secondary school teachers are permanent and real supporter of modern education. Though all the circumstances seem positive and productive but it is not in reality, which researcher had found.

As Nepal is the multi-cultural, multi-religious, multi-lingual and the country of diversity on this school many more differences among the students. The locality is the combination of Newar, Madhesi, Gurung, Rai, Limbu, Tamang, Sherpa, Magar, Chhetri , Brahamin etc. The parents of the students are involved in different jobs like business, government service holder, private job, farming and many more. This area is prime location and popular area for the business and manly popular bye the name of different renowned private schools.

Physical Facilities of the School

The physical facilities and infrastructure of the institution plays the key role on its well functioning. As the school is the place of gaining and sharing the knowledge. For the ideal teaching and learning activities different aspect are essential. Among those aspects physical aspect is the major one. Talking about the Nightingale it has seven different buildings. School has managed the Well play ground, canteen, toilets, taps, and the fresh room for laboratory activities. As each class has about 250 students, six sections have been divided on each. Most of the classrooms are well ventilated and shining room, according to the physical development of students desk and benches has been made. The research had taken place on the Block-B among the 7 Blocks of the school. On Block-B there are near about 100 staff including non/teaching staff. Each class is under a supervisor to make the systematic teaching learning activities. The research has sample from the Grade-VIII in which 12 teachers were there for same class to teach different subject. From Grade-VIII two maths teachers were respondent of my study. Following

were the statements said by the different personalities on the question “What is your view on facilities of school?”:

“The physical facilities are in the level of satisfactory”

‘Head of Maths Department’

“There is no any facilitator for us who can help us for the use of computers in the classroom teaching about the geometry.”

‘Maths Teacher’

“There is one way traditional teaching and boring theorems in the geometry class. There is no any sufficient multimedia and books about the geometry and maths”

‘Student’

“The infrastructure of the school is in the satisfactory level still there are problems in the summer season and the pure drinking water.”

‘Parent’

As the teachers and students told there is problem of the modern techniques of the teaching in geometry. Not only maths teachers, these problems are being faced by all the teachers. The placement of fans in the classroom was not so good and students were suffered by hotness. For the Extra Curricular Activities most of the facilities had provided by the school which is good support for their all-round development.

Classroom Composition and Instruction

Classroom is the small composition of society. Every student different are in cultural, ethnicity, religion and economic background. Classroom is the place where teacher execute his/her plan of teaching and student achieve the knowledge. To instruct the lesson classroom must be appropriate and well facilitated. Classroom environment is an important area of study in

education. It has been identified in contributing factor in child educational development. Classroom environment provide a network of social, physical and intellectual forces which affect the students mathematics achievements. Likely wise different family environment includes supportive atmosphere, supervising homework, providing supplementary reading materials and tutor and if possible facility of computers.

Mathematics is the core - content subject of our schooling practice. In the all level of schooling Mathematics is the major one subject. The teaching and learning situation is not the same in all schools of Nepal. On the one hand, the majority of government schools have been facing the problems of quality in teaching. On the other hand, some private schools have been implementing student-centred teaching strategies in mathematics teaching. As a result, geometry teaching and learning situations vary accordingly. As we know teaching is art and talent of the instructor how he/she deliver the content to his/her students. Mathematics is one of the core subjects to be offered by all students till the tertiary levels of education. This compulsory nature of mathematics carries with it the assumption that the knowledge of the subject is essential for all members of our society. Mathematics competence is a critical determinant of the Post-secondary educational and career options available to young people. Mathematics is a compulsory subject at the primary and secondary levels. School-mathematics-curricula of Nepal have given emphasis on geometry learning from the beginning of schooling. The curricula have aimed at developing students' understanding of intended geometric concepts at primary, lower secondary and secondary level. Similarly, according to the National Council of Teachers of Mathematics, geometry is one of the "content standards" of school mathematics, which aims at developing spatial reasoning, problem solving skills, and communication. So, geometry is regarded as a core content area of school mathematics. About the classroom environment and instruction of

geometry researcher got the following responses on the question “what is your views about classroom reality?”:

“We have the students from different ethnic and main stream groups. Most of the students are from the middle-class and few from the upper class as well. There is co-operative environment in class.”- ‘Head of Maths Department’

“In Grade-VIII section has been divided according to their admission, which has created the heterogeneity in the level of students. This is the main cause of difficulties to make them understand the different topics of math.”

‘Maths Teacher’

“We have good relationship among our friends but the smarter students they have made their own groups and they won’t involve in our team. Teachers give their focus to the good students who are talent in math.” ‘Student’

“My child is positive about the classroom environment and with his/her friends.”

‘Parent’

By the observation and the informal conversation researcher had got good environment and social harmony among students-students and students-teachers. This must be helpful for the teaching learning achievements. Though there is good environment in the relation between teachers-staff-students but it seems for relation only. This positive environment can be fruitful but it is not been used by students.

Teaching and Learning Environments and Reality

In his classroom observation Researcher got many more reality about the teaching-learning activities. The teacher with the content and with the skill to deliver it is really two different aspects. School has provided 40 minutes for each class. Researcher has visited the class of two different teachers of Grade-VIII. Classroom activities had observed as the teacher wants with all the required condition for continuous three weeks of Falgun - 2071. During these three weeks 10/10 class of both teachers had been observed and observation notes had written. Now, presenting the realities:

Teaching Episode

Usually teachers used to teach the continue chapters by connecting with previous lesson. There wasn't any such interesting beginning and simply the traditional instruction and no any extra way of starting the classroom. Once researcher got the teacher came with different solid shapes and he asked to students to identify different things and fact existing on it. At that day Researcher asked to respondent students and they replied it was quite interesting and he/she knows about the lesson which was taught.

The above ground realities show that low achievers are facing the problems in classroom. In educational settings created according to the Van Hiele model, it is aimed at developing high level thinking skills such as implication, association, communication, problem solving, spatial thinking, and creative thinking besides geometric concepts and the relations among these concepts. Creative thinking is one of the high level thinking skills that model aims at developing for students. Creative thinking is a skill which is aimed to be developed in all mathematics curricula from primary school to higher education. Creative thinking is a thinking style which

enables the individuals to produce new and authentic products, find new solutions, and reach a synthesis. Creativity means being critical and proposing new suggestions.

As the standard of the content in geometry both teachers were interested about the topic. In comparison of teachers students were not that much interested about the new lesson. Once Researcher asked to respondent why you all are not interested to today's topic, he answered that the lesson which was going to be taught they didn't have the basic concepts. The way how they taught it was generally centered to the fast learners. Slow learners were just the passive learners. Use of different teaching materials in geometry plays the essential role to make the clear the concepts. Teachers were not that much interested to collect the instruction material. Even they were without the basic knowledge what types of materials can be used in the specific topics. Most of the classes were teacher centered and students were the passive copy pesters in geometry class.

The van Hiele theory suggests that learners advance through levels of thought in geometry. His levels are visual, descriptive, abstract/relational, and formal deduction. At the first level, students identify shapes and figures according to their concrete examples. At the second level, students identify shapes according to their properties, and here a student might think of a rhombus as a figure with four equal sides. At the third level, students can identify relationships between classes of figures (for example, that a square is a special form of rectangle) and can discover properties of classes of figures by simple logical deduction. At the fourth level, students can produce a short sequence of statements to logically justify a conclusion and can understand that deduction is the method of establishing geometric truth. According to this model, progress from one of Van Hiele's levels to the next is more dependent upon teaching method than on age.

Given traditional teaching methods, research suggests that lower secondary students perform at levels one or two with almost 40% of students completing secondary school below level two. The explanation for this, according to the van Hiele model, is that teachers are asked to teach a curriculum that is at a higher level than the students.

According to the van Hiele theory it is not possible for learners to bypass a level. They cannot see what the teacher sees in a geometric situation and therefore do not gain from such teaching. To teach geometry effectively to students of any age or ability, it is important to ensure that students understand the concepts they are learning and the steps that are involved in particular processes rather than the students solely learning rules. More effective teaching approaches encourage students to recognize connections between different ways of representing geometric ideas and between geometry and other areas of mathematics. The evidence suggests that this is likely to help students to retain knowledge and skills and enable them to approach new geometrical problems with some confidence.

Except few lesson teachers were no more interested to use the materials. While the chapter was about the calculation of the area and volume of solid both the teachers were using the solid materials. Researcher got that most of the classes were just teachers centered and lecture. Both the teachers were Non-Education teachers and they have listened about the teaching methodologies but they lacked willing of knowing about it. Usually classroom evaluation used to be done by both the teachers. Researcher got while asking question they focused on the confusion of smarter students not that of the slow learner. Once teacher asked to my respondent to identify the axiom by what the given two triangles were Congruent. My respondent couldn't reply and teacher told to ask the second girl of the classroom. He didn't try to make her clear about it. This was the thing

to be noted. When concluding the lesson they used to explain all the important point which can be the required for the further lesson. Generally they addressed the confusion of first few benchers and used to give the Home-works from textbooks. Those task were just about the lesson not that much creative and fruitful for my respondents.

When we plane about the approaches to teaching and learning geometry, it is important to ensure that the provision in the early years of secondary school encourages students to develop an enthusiasm for the subject by providing opportunities to investigate spatial ideas and solve real life problems. There is also a need to ensure that there is a good understanding of the basic concepts and language of geometry in order to provide foundations for future work and to enable students to consider geometrical problems and communicate ideas. Students should be encouraged to use descriptions, demonstrations and justifications in order to develop the reasoning skills and confidence needed to underpin the development of an ability to follow and construct geometrical proofs.

Techniques of Assessment and Extra-Activities

Evaluation is the process of assigning the activities according to the rule. On the teaching-learning activities assessment is the key process of addressing the feedback. Traditionally the paper pencil test was popular but nowadays there are many more alternative tests are in practice. To evaluate the different abilities of the student's alternative tests must be actively execute. On this school there is the systematic unit test of each subject. Especially one thing I got for the mathematics and science two unit test system has been implemented. For the math Arithmetic and Geometry has divided in two unique subjects for each examination. Continuous evaluation for the slow learner (for the failure) was there. Giving homework and

different task is also a tool of continuous evaluation. Teachers were actively working on the aspect of homework and project types works but I got that the students were not that much satisfied by these activities of the teachers. Talking about extra-activities, students with the extra talent were identified from the joiner classes and they got the chance to participate on those activities. Researcher got the different types of response on the question “How is the examination and co- curricular activity?” which is as below:

“School conducts the examination four times and each Sunday there is unit test of one subject to measure the learning achievements of the students. Especially for the math we do have double exam as a separate subject Arithmetic and Geometry which can be effective on to identify the difficulties of the students on the specific subject.”-‘Head of Maths Department’

“We have regular exam on each Sunday. For the weak students we have to conduct the re-exam time and again until they improve on the specific subject. This academic year we took 10 re-exam of Geometry.” ‘Maths Teacher’

“Regular examination is there so it is quite boring and boredom for us. If it is like terminally we can do better due to what we can get more time to study.”

“About the homework teacher gives us but they won’t check regularly. Just they collect it on the end of the chapter/unit. We also have the habit of doing at last only and sometimes we were scold by him even we were bitten so many times.”

‘Student’

“Evaluation system is very nice in Nightingale School. Questions are set by head of department and it is very standard. Generally my kid is not serious during exam he/she seems doing his/her ordinary activities. Extra activities are not in practice what we can feel. It is just in the name of co-curricular but in reality Nightingale doesn’t have the system of extra activities.” -‘Parent’

The evaluation system is really good but it is not been developed as the collection of feedback and the tool of identifying weaknesses. Lack of the feedback collection and focus on the weakness it can be just in the name of examination only. Extra activities must be included to the harmonious development of the child. I got many complain about the extra activities which is very far from the system of this school to address each student.

School Policies

A school can have its own motto. According to the leader of school there can be the different policies on the aspect of relation of teaching, students demand, parents’ views and all the related stake holders. School is the place where all-round development of students starts. In one sentence school is the next home where we start our socialization and step of skill gaining. According to the different success story of the students does the administration provide some response to the individual or not, it plays the role in the positivity of each of them. Likely wise the participation on different social activities games, incentives to teacher staffs and response to parents/stake holders plays the role in the success of a school. I got good impression of Nightingale on these aspects. Only few parents were unhappy that it is quite expansive and less focus on the social activities.

I. Achievements in Maths and Geometry

Since few years the result is not in the level of satisfactory. Out of 40 students on each section about 40-50 % of them failed in math and especially in geometry. It was found that in comparison of other subjects more students were failed in geometry in the 'Evaluation Term' (which was held in Magh first week -2071). On the question "what are your views on student's achievements on geometry teaching?" researcher got different responses:

"In this evaluation test out of 253 students in Class-VIII, about 40% of the students were failed in Geometry which was the serious mater once again for us. We are making plan to execute the other training program to all the math teachers of secondary level on Geometry teaching."

'Head of Maths Department'

"Question was quite difficult so more students were failed. One thing is there in our students they lack the basic concepts. Few of them must not be upgraded in upper class. There was continuous exam before the exam of Geometry but previously there use to be minimum one day gap for geometry. Now I have started the extra effort by working Work-Sheet to the failure. Let's hope they will do well in final exam."

'Maths teacher'

"Result was not good in Geometry. We couldn't prepare as well as we can due to the continuous exam but previously there used to be gap before the exam of Geometry. All the questions were out of the textbook just concepts were matching so we couldn't do better."

'Student'

“In the Evaluation Test my kid didn’t do better. I was expecting there can be something better but it was not like that. As before my child did and failed once again.”

‘Parent’

By these circumstances we can ensure that there is big problem in geometry instruction. We can see Appendix- F to observe the result and can analyze that for the geometry new good plan must be implemented to improve these conditions. My entire sampled / respondent children were failed by the first term. Most of my respondent got single digit number in 100 full marks test. Not only single digit out of my six respondent four of them got 0/1 marks; which is really the topic for study.

II. How can Low Performer be Promoted

There is problem in all the logical subject matters for the slow-learners. Generally the have the habit of learning seriously during the last week of examination, which can not be fruitful for each subject. Geometry needs the continuous practice. According to the interviewed done previously researcher got different remedial ways for this problems in Geometry on the question “how low performer can be promoted?”:

“We have plan for training for the teachers this year. Next thing is that we will make the section according to their performance such that the students with same level can be together and they feel easy to be together. Extra- Class will be continuing for whole the academic year for the weak students. We will implement this plan from the beginning of the academic year 2072.”

‘Head of Maths Department’

“We will use different teaching methods to teach not only this lecture method. As I have listen collaborative approach, co-operative method and many more which can be effective those we will use. We will make the homogeneous group and section of the students. As there will be training for us in last of this academic session, which can be fruitful for us. We are ready to use teaching material if administration will provide but we can not force them.”

‘Maths Teacher’

“Most of my friends they have tutor at there home to share the difficulties on any subjects. My parents are not able to teach me and if I couldn’t do home-work, I just use to copy from the friends. If teachers give focus to us not only the good students while teaching we can be the good one. Teachers don’t use any teaching materials just hypothetically they teach and forced us to do home-work.”

‘Student’

“Teachers must focus to weak students not only good. I am sending my child to the extra-class but there is no change in Geometry. I am thinking to keep Home-Tuition.”

‘Parent’

By the above views we can expect change in upcoming academic year. There are lots of ideas to improve this level of students in Geometry. The administration has made the plan for training for the teachers that can be the one good remedial measure. Another good thing is that teachers are curious to know different teaching techniques and information technologies

to instruct the Geometry portion. Extra effort must be done from each of the side to improve this condition.

Findings of the Study

By this case study of the Detrimental Factors of Low Achievements in Geometry following are the major findings:

- i. In comparison of other subjects there were more students who failed in Geometry.
- ii. The infrastructure of the school is okay. Each class is well ventilated and sunny rooms. For the summer no management of fans.
- iii. Qualifications of teachers were good but they were not well trained. Some of them were newly appointed.
- iv. Difficulty is there in the teaching of maths due to the randomness of students in their levels. Specially some of the students were without their basic knowledge in geometry.
- v. There is problem in permanence of geometrical knowledge, skills, relations and concepts learnt by students.
- vi. No any success story in the development of geometrical reasoning by the students. There was rote learning on the verification type questions and other theorem related questions.
- vii. Teachers were unsuccessful to work with low achievers in the part of geometry. Even there focus is not on the failures but they denied to accepting that there is lacking from their sides too.
- viii. Some of the topics in geometry are out of reach of low achiever. Students should be made to work extra-hard to improve their poor foundation.
- ix. Lacking is there about willingness to learn from the student's side and they should be involved in more practical works than theoretical.

- x. Lacking is there for the teachers to participate on the interactions, workshops and training related to the subject matter.
- xi. No more knowledge about the new techniques and teaching aids.
- xii. Evaluation system is central and one-way system, the tools of evaluation has been taken as a paper pencil test only.
- xiii. Some of the curriculum related factors which is also the causative agents of the low achievements in Geometry.

The purpose of the study is to identify the detrimental factors for low achievement of geometry; here researcher has got many points on it. Each aspect has their own drawback here also the researcher has indicated many problems. Problems wont comes itself alone it comes together with its solutions. According to the history of the school these problems can be the things of past if different remedial measures can be implemented on the practice.

Chapter V

SUMMARY, CONCLUSIONS AND RECOMMENDATION

On this section major findings of the research and its conclusion will be listed. From this study we have got different types of ground realities of the private school as well as all the schooling practice of Nepal. Here by the topic I will mention my findings on different factors. It is only concerning about to identify the detrimental factors of low achievements and its remedial measure in Geometry. Summary, findings, conclusion and recommendation will be listed one by one.

Summary

Especially this case study is under the case of low achievement in Geometry. It had tried to seek the detrimental factors of low achievements in geometry and its measure. As the purpose of the study is to identify the detrimental factors for low achievement of geometry, here researcher has got many points on it. Not only to identify the causative factors of low achievements it was concerning on its remedial measure too.

The study has been done in a popular institutional school which has the good result in each subject but by 2/3 years it is facing the low achievement in Geometry. For the study data had collected by visiting the Head of maths department and maths teachers. Firstly the respondents were selected by the ledger of the student of Grade -VIII and six low scorers had selected for interview. After that where ever those students were studying those Classroom activities had observed as the teacher wants with all the required condition. The observation notes had written. The students and parents interviewed and the response had recorded with audio- visual device. Some of the open ended questions were asked to know their attitude and

expectation from maths circumstances, about their experience, opinion, feeling and knowledge of mathematics.

After collecting the data it was categorized according its theme and answered. Whatever the clue given by teachers, students and parents those were coded and kept together on different topics as the response about examination, result, facilities, extra-curricular activities and many more. Some of the theme of teaching style and use of techniques what had been got from the classroom observation of two teachers of 10/10 days, those were also categorized in different subheadings. After these triangulation and Constant Comparison had been done by what following findings has been listed.

Conclusion

A finding of this case study has shown that Geometry teaching- learning is not in the level of satisfactory at Lalitpur district. Even there is lacking from both students and teachers to overcome from the problems in Geometry. In short we can make the conclusion that the time has already came to think from the higher level.

- Foundation of the instructor and the learner is not in the level as it has to be in geometry.
- Students have poor generalization power in Geometry, as such cannot solve problems even when similar example given in textbook.
- The interest of the students to improve their level is no more towards Geometry, lacking on the willingness to learn new concept in Geometry.
- Lacking is there to search new teaching techniques, material related aspect and the evaluation tools.
- It was found that if the necessary provisions are made and proper monitoring are made on the students and teachers, these problems and factors will be the things of the past.

Recommendations

This is only the macro level study in the detrimental factor of low achievements in geometry. In our context we must give emphasis of geometry learning. In the similar manner contextualisation of learning and change from the traditional one-way classroom to two-way interactive classrooms is required to change the level of Geometry in school level.

It was just a micro case study of a private school so this result can't be generalized in all the situations. To make the adequate conclusion we must do same study in mass sample. There can be the different queries about it as below

1. Is our curriculum is good in the perspective of Geometrical concept?
2. Is it in the level of learning difficulties child?

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Appendix-A

Classroom Observation Notes

The classroom observation notes will be prepared on the basis of different indicators. Notes will be prepared on the natural class setting along with the permission of the subject teacher. Under the teacher's convenience, classroom teaching learning activities will be studied on the following basis.

Teacher's Name:

Topic:

Grade:

No. of students:

1. Physical facilities and structure of the classroom.
2. Teaching learning activities:
 - a.) Beginning of the class: creating and maintaining the physical setting that maximize the learning achievements and minimize the discouragements.
 - b.) Setting the learning stage: communicating the objectives appropriately; checking the connection of previous learning, current and future learning; delivery of the content on the level of the students.
 - c.) Acquisition of Learning: combining auditory explanation with visual references and students involvement; providing teacher-directed structured practice in which all students participate; use of motivational techniques to maintain interest and involvement of student; providing guidance; encouraging on discussion and group activities; co-operative learning; peer teaching, project works, working with worksheet; independence practice etc.

- d.) Collection of instructional materials: collecting audio-visual material, different solid objects, construction materials and many more which can facilitate the teaching learning of geometry.
- e.) Completion of class/ lesson: relating the lesson with objectives; sharing of confusion and different queries of students; connecting with upcoming lesson; encouraging the students to collect the same concept on different topic and to showing their talent; providing assignment and project works.

Appendix-B

Guidelines for interview with students

Name:

Class:

Roll No.:

Sex:

Address:

1. Views on facilities of school.
2. View about mathematics and geometry study.
3. Views on his/her achievements on geometry.
4. Views about his/her teacher and classroom practice.
5. Views on the causes of his/her failure on geometry.
6. Views on how he/she can be promoted and family supports.
7. External needs and his/her views on the education and its practice.

Appendix-C

Guidelines for interview with Mathematics Teachers

Mathematics teachers will be interviewed under the following topics.

Name:

Qualification:

Sex:

Teaching experiences and Training:

Address:

1. Views on facilities of school.
2. View about mathematics and geometry study.
3. Views on his/her achievements on geometry teaching.
4. Views about his/her teaching and classroom practice.
5. Views on the low achievement of geometry.
6. Views on how low performer can be promoted.
7. Views on the relation of low achiever and their family/parents.
8. External needs and his/her views on the education and its practice.

Appendix-D

Guidelines for interview with Head of Department of Mathematics

Head of Mathematics Department will be interviewed under the following topics.

Name:

Qualification:

Sex:

1. Views on facilities of school.
2. View about mathematics and geometry teaching learning.
3. Views on achievements of geometry teaching.
4. Views about mathematics classroom practice.
5. Views on the low achievement of geometry and policy on remedial measures.
6. Views on how low performer can be promoted
7. Relation with staff, students and parents.
8. View on the education and its practice.

Appendix-E

Guidelines for interview with Parents and Stake-holders

Parents and Stake-holders will be interviewed under the following topics.

Name:

Address:

Qualification:

Sex:

Occupation:

Family Size:

No. of Educated/ Uneducated Members in Home:

Annual Income (Approximately and Optional):

1. Views on facilities of school.
2. Views on achievements on geometry of his/her child.
3. Views on how low performer can be promoted and family supports.
4. View on policy of remedial measures.
5. Relation with teacher and staff.
6. View on the education and its practice.