Chapter I

INTRODUCTION

Background of the Study

     The place of Mathematics in the life of any nation cannot be overemphasized because it is linked with the place of development in that nation. Science, Technology and Mathematics Education (STME) have been widely acclaimed to be the index of measuring any nation's socio-economic and geo-political development. Among science and technology courses, according to the National Policy on Education, '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 the subject that has significant impact on people. Every people need mathematics to solve the problems in the daily activities. The development of mathematics was simultaneous with the development of society. The development of mathematics has its far history with the development of human civilization. "Mathematics is used throughout the whole world as an essential tool in many fields, including natural science, engineering, medicine and the social science" (Bell, 2008).

     Mathematics provides the knowledge. "Mathematics is the body of knowledge and information related with the concept of quantity, structure, space and change and also the academic discipline that studies them" (Michaels, Grossman, & Scott, 1967).

     Thus lots of Mathematics educators have put up noble and spirited efforts aimed at identifying the major problems associated with the teaching and learning of

mathematics basically in the geometry portion. Despite all these noble efforts, the problem of poor achievement in mathematics has continued to rear its head in the nation's public examinations. 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.

Teaching is the delivery of ideas or principles by an authority. Generally, teaching includes subject matter, platform, delivery of an idea and specific interaction between teachers and students. Teaching is concerned in a goal that the nation, society and presents desire.

Learning is the act of acquiring or modifying and reinforcing existing knowledge, behaviors, skills, values or preferences and may involve synthesizing different types of information. While the teacher uses visual materials, gives sequential and conceptual idea with complete definition, explanation and proof the teaching becomes more behavioral and joyful therefore teaching and learning are coined to each other with content, context and method.

Different educational reports have given emphasis in method of teaching. Nepal National Education Planning Commission (NNEPC 1954), All Round National Education commission (ARNEC 1961), National Education Plan (NESP 1971), primary report of Royal Higher Education Commission (NEHC 1998) has been given importance to method of teaching. For educational improvement innovative teaching techniques and advance teaching equipment with perfect training should be involved for every subject as it is clearly mentioned in NESP. Therefore in this research the researcher has raised some findings that he got by observing and evaluating some

secondary level school teachers of Kathmandu district and introduced the ideas of solution on the basis of their way and status of teaching geometry portion in secondary level classroom.

Being the secondary level mathematics teacher in this locality, the researcher realized lots of weaknesses related to geometry and also dissatisfied with the teacher selection system which became his current intention to select this topic as research topic.

The factual answer to what is geometry is necessarily incomplete. Geometry includes an enormous range of ideas and can be viewed in many different ways. Throughout its development during the past twenty five centuries geometry has been interlocked with many other subjects and different kinds of human activities. So as the background the researcher has focused at geometry in the most common sense as – the way to see something of the naturalness of geometric ideas, their interests, verities and importance.

Statement of the Problem

There is increasing evidence that many students in the middle years (11-15) of schooling have tremendous misconceptions concerning a number of important geometry ideas (Burger et al, 1996). There are many possible reasons for this. Furthermore, a divergence of opinion exists in the mathematics community about the methods and outcomes of geometry and as a result, textbook writers and producers of syllabuses have failed to agree on a clear set of objectives.

Anecdotal evidence suggests that many teachers do not consider geometry and spatial relations to be important topics to be taught in schools. This gave rise to

the feelings that geometry lack firm direction and purpose (Burger et al, 1996).The poor performance of students in mathematics and geometry in particular has been a thing of concern to mathematics educators, parents and government. With the same purpose this study also has been conducted.The study is concerned about the study of the problem faced by mathematics teachers and students in geometry in secondary classroom enrolled in private schools of Tokha Municipality, Kathmandu. The study was concerned to find the answer of the following questions:

- What factors are responsible for the difficulty in geometry in secondary schools?
- What strategies could be adapted by teachers, schools, society and nation to enhance better teaching and learning of geometry in secondary schools?

Objectives of the Study

This study is aimed to:

- identify the factors that contribute to the difficulty in teaching and learning of geometry.
- suggest the probable strategies that could remedy the difficulty in the teaching and learning of geometry.

Significance of the Study

This research primarily is an objective analysis of the reliable data collected in Tokha Kathmandu therefore the research proves itself to be an exploration of problem faced by different teachers along with students. At the same time since the research targets at suggesting the probable solutions during teaching learning process it works

as a cornerstone in designing curriculum, drafting lesson plans and presenting ideas in classroom.

The result of the study provides true information about the problem faced by the teachers and students of Tokha. It can be taken as a good base to the policy makers, curriculum designers, subject experts and researchers since it reflects the status of the study of the school level geometry portion of Tokha at the time of research which could be one of the representative to indicate the present condition of teaching and learning geometry and would enforce the formative supervision for the progress of geometry portion in school level.

Limitation and Delimitation

This study was limited in the following boundaries:

a. It included 10 mathematics teachers, ten guardians and 200 students who currently related in teaching learning activities in secondary level mathematics classes,

b. The study was limited on the teachers and students of private schools especially of grade 10,

c. The study was conducted in urban area carrying about six month.

d. The study was limited on the Tokha Municipality.

Definition of Key-terms Used

School: The public place where student learns the various skills and the teacher

  teaches.

Teaching-Learning: An activity done inside a classroom for gaining and sharing of

  knowledge based in a fixed curriculum.

Secondary Level: The level containing grade nine & ten in Nepalese School system.

Students: In this study student means those who involve in learning secondary level

  school mathematics.

Teacher: In this study teacher means teacher who is teaching secondary level school

  mathematics.

Problem: Learning difficulties faced by teachers and students while teaching and

  learning geometry.

Chapter II

REVIEW OF RELATED LITERATURES

This section includes review of related literature and focuses on the different aspects that create problems in instruction of Mathematics. Furthermore, it deals with review of empirical literature, implication of the studies and conceptual framework. The review of related literature deals with the theories of research studies which have been conducted earlier. It helps to conduct the new research study in systematic manner by providing the general outline of the research study to avoid the unnecessary duplication. There are various literatures on teaching and learning mathematics, numbers of books, research reports, papers and other booklets can be found that concern with curriculum, teaching materials and methods and so on. The review of the related literature of this study and theoretical framework of this study deals with the books, theories, research studies and articles related to the study which were collected and studied by the researcher. In sum, literature review accomplishes the following function:

- It reveals the areas of needed research,

- It avoids duplication of costly research report,

- It gives the specific framework for the study,

- It establishes a point of departure for new research.

The topic selected is completely new. The parallel paper submitted by early researchers has raised physical problems, gender difference and are depended on cast, achievement, enrollment and so on. In this study the actual classroom performance and its condition has been submitted. For the paper different books by foreign writers have been read, consulted with expert frequently and regularly.

Mathematical journals and articles of different researches have been consulted sufficiently. G-MAT, co-ordinate geometry, various school and college level mathematics books, thesis papers of different colleagues and seniors have been read. Researcher also had involved in the workshop organized by Gyan Sindhu Higher Secondary School in the leadership of mathematics teacher of Budhanilkantha. Each and every portion has been completed with hard labor and with kind honesty with the best of researcher's knowledge and belief with respect to available sources and materials that one can understand on reading this paper.

Empirical Review

Each and every research work requires the knowledge of previous background to open the targeted objectives and to validate the study. Here, this section is an attempt to review the related studies, articles and the reports. Some of the old thesis has been reviewed considering them as a related literature and also as evidence to the present study.

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

Adhikari (2006), Conducted a research on cultural discontinuity and learning difficulties in Mathematics: A case study of primary Dalit school children: The main objectives of this study was to identify the cause of difficulties in learning

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Mathematics of Dalit children of school and to identify the influencing factor in learning Mathematics for the Dalit children at school. This study was focus on all the grade five students of Banibilas secondary school of Chapagaun V.D.C. in Lalitpur district. He used in-depth interview, observation for the data collection procedures. This study found that there is discontinuity between silence culture and forwarded culture. He also found that Dalit children have poor language ability and they cannot concentrate in their study due to their involvement in household works.

Poudel (2007) carried out a research entitled "A study on the mathematical skill used in tailoring". This study found that many conventional mathematical concepts are embedded in the practice of the tailoring. He made expensive use of such concept are playing, perpendicular, straight line, parallel line, area, pre operational congruence, similarity, circle, curves, parabola, fraction, mid points of the line in everyday work. These mathematical concepts mostly used to make different types of clothes. To make clothes they use mathematical concepts knowingly or unknowingly. At the time of tailoring, tailors used shape-cult, image table, cutting table, measuring tape, square, tailor chalk, scissors etc. As the tools of methodology of the research was observation.

Bom (2009) also carried out a research study on the topic, "Effects of home environment in mathematics learning". This study was based on the objectives to assess the existing learning achievements of Baadi children in mathematics of lower secondary level of Rukum District. He applied written documents and the previous research reports. Furthermore, he also used interviews, interaction, observation and FGD to collect data from five students studying in different classes in Lower secondary level. His study conducted that parents of students were not responsible for

learning achievements of their children; He further found that the students were not discriminated by the teachers.

Bhatta (2012) has also completed an M.Phil. Case study research on the topic "Classroom practice at primary level: a multicultural perspective". The site of the study was Gram Sewa Higher Secondary School of Kathmandu district. He selected participants by using purposive Random Sampling Method. His study was focused on ten teachers, twenty-four students & six guardians concerned to Gram Sewa School. He used both questionnaire and interview to collect data from the participants to fulfill the objectives of this study. The main objectives of this study were to identify the situation of Primary School students from multicultural perspectives and to find out the practices of teaching in multicultural classroom setting. He found through his study that teachers have applied individualized teaching rather than group teaching to address the issue of multicultural setting. He further found that the teachers were unable to address all the students' equality through extra-curricular activities and they have been applying the traditional way of classroom setting. In a nutshell, he found that classroom practices at primary level were not culturally responsive and relevant.

Majhi (2012) carried out a research on a study of ethno mathematical concept practiced by their community in Morang district. He started his research with the objectives to identify ethnographic mathematical concepts used to construct artifacts in Tharu community. He used observation, photographs, and interview to collect primary data for his study. He studies the Tharu community of Kaseni VDC Ward No. 9 of Morang. He found through his study that their community children used different mathematical concepts in their daily works but they were ignorant of its use in pedagogy.

CERID (2004), in a study report concludes that children's participation and continuation on education depend upon parent's attitude towards educations. How children's continue their education was totally, depend upon the attitude of the parents, when parents realized the need of their children's, this is the opportunity to the children and education.

Bhatta (2014) has also conducted a research on the topic "Pedagogical process of mathematics teacher in ethnically plural classroom in secondary level". The objectives of this study were to explore the management practices of secondary teachers to manage diverse classes and to investigate the learning needs of different groups of students. The study was limited in ten surrounding secondary schools in Kanchanpur district. He selected 50 secondary students and the ten teachers for his study. Interview, observation and the questionnaires were the tools to collect the data for his study. He concluded that disconnected teaching activities and tradition oriented teaching methods and materials were mostly applied by secondary teachers in their classrooms. He further found that lack of knowledge in mathematics teacher has also a barrier to make all the students equally involved in the classroom.

Though various researches have been made regarding the problems faced by teachers in mathematics, problems faced by students in mathematics, problems related to gender difference, economic status, urban and rural school, materials, caste, culture and so on there is scarcity of research in the field of research on "the problems faced by secondary level teachers and students in teaching and learning geometry". Carrying the same topic and following the same process of data collection and analysis no researches have been conducted in this area. This research will fill the gap between the theoretical perspective and practices. The researcher aims to find the

actual problems faced by the teachers and students in geometry portion through teachers' response, class observation and achievement test. So the researcher believes that the topic is suitable for the research related to contemporary issues.

Conceptual Framework

The analytical management or design which contains the factors affecting achievement of mathematics and hindrances that faced by teachers and students in class performance of geometry portion. By the help of literature review, expert consultation and peer discussion it had been constructed by the researcher himself including school related and out of school contextual factors to make the study specific, systematic and easy.
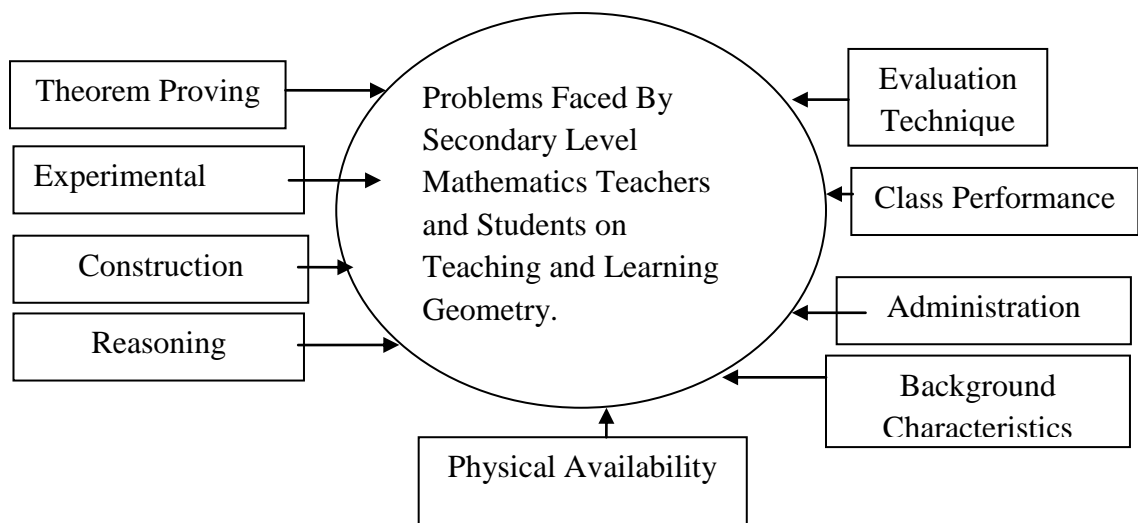
Content Related Factors

Theorem Proving: The topic has raised the problems related on learning theorems. For the purpose it dealt with the basic concept of students related to postulates, axioms, definitions and basic facts. Also there were the problems in arranging the relation sequentially.

Experimental Verification: It is practical measurement of figures by geometrical instrument to prove the theorem. It helped to find out the problems in sequential idea in verification and proper use of materials.

Reasoning: It is related to giving logic to find the measurement of given sides, angles and distinguishing the relation on figures. Theorems, postulates, definitions and basic rules etc. are the main base of reasoning. Ideas and knowledge of these terms also help on theorem proving which the causes of problems on geometry learning were.

Construction: It is related to constructing geometrical shapes on the basis of given terms and conditions. Construction related to triangle, parallelogram or quadrilateral in a single diagram with equal area requires complex knowledge of analysis and combination of concepts. Students having fewer concepts of axioms, theorems and postulates mostly had the problem on construction.

Out of Content Contextual Factors

Class Performance: It is one of the most important factors that actually reflected the problem faced by the teachers and students by various causes as: teacher's idea of delivery, instructional environment and initiation of lesson, proper use of proper materials in teaching, student's participation and teacher's activities were considered as the effective classroom teaching in this study.

Administration: It is related to the arrangement of teacher, routine, class observation and plan for extra activities. Management of instructional materials, lab, refreshment training and smooth school environment were the responsible factors related to school administration that affected on teaching learning activities.

Physical Availability: Standard and advanced physical and instructional management helps in easy learning of complex structure. Arrangement of class, light and ventilation, cleanness, availability of furniture, quality and availability of writing board and graph board, computer as teaching equipment were some aspects of physical availability considered in this research.

Evaluation Techniques: Evaluation informs about the present position and determines the points to be improved. It further gives the feedback, suggestion and motivates the learners and also the teacher for better progress. Verbal evaluation, unit test and terminal test results were the tools of evaluation techniques.

Student's Background Characteristics: Learning is directly affected by family environment. Culture, awareness, civilization and the level of the family also effect on the learning of children. These aspects psychologically and behaviorly effect on children's learning so had become the vital aspect to be cared in teaching learning activities. Individual suggestion, gender equities, peer's help and activeness on learning mathematics, informal discussion and practice done by them were also taken as background characteristics.

METHODS AND PROCEDURES

Research Design

Research design is the specification of the methods and procedure. It is also a way of the research that provides the direction for the researchers to achieve the goal of the research. Research framework is derived from research design. This study focuses on the problems faced by the teachers and students in teaching and learning geometry in secondary level. This is a research based on survey design**.**

Study Site

Kathmandu is the capital city of Nepal having students from all 75 districts and 14 zones. Students of Kathmandu, being from various cultural and linguistic backgrounds have their own way of learning. The students from the highly crowded municipality Tokha of this vast city had been selected as the study site for this research.

Population

The population of this study consisted of all the secondary level schools, mathematics teachers and students of grade 10 (also the guardians) of Tokha who currently involved in teaching learning program directly or indirectly.

Sample

The participants of this study were ten secondary level mathematics teachers, ten guardians and two hundred secondary level students. Altogether 220 candidates

were taken as participants (sample) from the population above by simple random sampling method. The selected schools (students, teachers and guardians) were situated in different VDC of this Municipality.

Tools

The major means of collecting data were observation form, achievement test paper and interview form to the teachers and guardians. Observation of schools, discussion with principals and students also were the additional supports to collect data. The tools were modified and developed according to the suggestion and guidelines of the supervisor.

Achievement test paper included questions from four different aspects of geometry (Reasoning, Experimental Verification, Theorem Proving and Construction). Class observation form contained the availability and use of basic and advance materials, cleanness, light and ventilation in class. It further included teacher's readiness, level of motivation and discipline, quality of content delivery. It also evaluated quality of class evaluation, recapitulation of lesson and amount of homework given. Interview guidelines to the teachers (Appendix V) and guardians (Appendix VI) were used to find out the ground reality of school environment, students homely environment, attitudes of teachers, parents and students towards each other and towards mathematics (focusing geometry). Their responses were also taken as the major base to enhance better mathematics achievement addressing related problems and were analyzed accordingly.

Appendix I was used to represent the class observation form, II includes the application; III contains test paper, IV contains the name of sample schools, number

of sample teachers and students, V includes interview guideline to ask for the teachers' and appendix VI is the interview guideline asked to the guardians.

Reliability and Validity

The content validity of the tools was established by the expert judgment. For the reliability of the test the researcher got reliable information by standardized intelligence test. Difficulty level of item is the index of difficulty which is the percentage of examinees that correctly answered the item so it takes the values from 0% to 100%. The criteria of analysis of item difficulty level are given by the table.

Item Difficulty Criteria

Criteria	Item Evaluation	No. of Item	Remarks
Above 75%	Easy	4	Removed
From 25% to 75%	Good	13	Accepted
Below 25%	Difficult	3	Removed

Reliability was determined by the students' ability to solve the questions. The questions answered by average students partially/completely were supposed to be reliable. The questions answered by all the students (even poor) and left by all the students (even better) were removed from the test. The researcher (mathematics teacher at the time of research) consulted with highly experienced, renowned and authorized book writer Mr. Hare Ram Thakur while teaching in Southwestern school together. Researcher further took the suggestion of supervisor who was the well experienced teacher of Master's level mathematics education in TU and also used to teach in Laboratory college of Kirtipur. Thus the test paper was prepared. The researcher did pilot study among 16 students of grade 10 in Uma Maheshwor English

boarding school, Lalitpur. The researcher tabulated the obtained scores from pilot test

for the item analysis. Following table is the index of difficulty values of selected item:

Nature of questions	No. of students answered partially/completely	Percentage %	Remarks
Reasoning	11	68.78	
Seen theorems	8	50	
Out theorems	6	37.5	
Experimental Verification	10	62.5	
Construction	9	56.25	

Data Collection Procedure

To fulfill the objectives of the study, related data were gathered by different

procedure such as: instrumenting achievement test paper, analyzing previous

documents, collecting guardians, and teachers' responses and observing classes. For

the study achievement test was administrated in ten schools including 200 students

using achievement test paper (Appendix III time 3 hours). Interview was taken with

the ten different teachers to evaluate the problems related to content, administration

and students background characteristic (Appendix V). Ten periods were observed in

different schools and the observation form (Appendix I) was filled. Interview was

taken to the selected guardians, some students' home environment was noticed and

also the responses of guardian were taken primarily for the data related to students'

background characteristics and for the remedial purpose to solve problems. About

three months had been consumed for data collection to find out ground reality of

achievement in secondary level geometry portion.

Data Analysis Procedure

The research adopted the descriptive survey method. Responses of teachers'
and class observation were interpreted and analyzed with the help of three point
Lickert scale. Statistical tool mean was used to find the mean weightage of both (class
observation and teachers' response). Answer sheets were separated in accordance
with the solution that students made. Percentage of students solving all or the
particular portions have been found, analyzed separately and different conclusions
have been derived. Responses of the parents and guidance of the supervisor were
taken as the key source to find the problems related to students background
characteristics and valuable bases to address the countered problems successively.

The result of class observation, guardians' answer to the asked questions,
result of achievement test and teachers' responses were used to answer the first
research question i.e. the responses helped to determine the reliable factors that played
vital role to promote difficulty in geometry learning. Scoring procedure for the
positive statement was- Strongly Agree (SA) =3, Agree (A) =2 and Disagree (D) =1,
for the negative statement was Strongly Agree (SA) = 1, Agree (A) = 2 and Disagree
(D) =3. Mean Weightage>1.8 was considered to be good for positive and Mean
Weightage<1.8 was considered to be good for negative statements. The data obtained
from observation and interview was in verbal form. Firstly the interview note and
observation diary was categorized based on different themes developed on conceptual
understanding of the study and then the data was analyzed descriptively on the basis
of themes. To suggest the probable strategies, observation note, teachers' and
guardians' responses and the idea of supervisor had been used.

Chapter IV

ANALYSIS AND INTERPRETATION OF DATA

The data were collected for the study from ten secondary schools of Tokha municipality. The collected data were tabulated and analyzed according to the objectives of the study. The tabulated data were statistically analyzed and interpreted by using statistical tool mean weightage.

The researcher took achievement test in 200 students by making standard question paper to find the ground reality of students' academic level which could help to find in which portion of geometry the problem actually is. Interview guideline was prepared and interview was taken to the teachers. It was implemented to find the responsible factors for the learning difficulties and possible strategies to address the difficulties. The researcher observed 10 different mathematics teaching learning activities of geometry portion to find whether there is problem in teaching strategy of teacher. The researcher also observed the physical strengths of selected schools as library, math lab, structure of building etc. as far as possible which could effect in math learning. The researcher also had met some guardians of secondary level students and visited the locality to know the homely environment. All these activities were done in the complete guidance, instruction and supervision of expert. The following are the topics related to the factors creating problems in teaching learning activities.

I. Factors Creating Problems in Teaching Learning Activities

    a.   Problems Related to Class Performance,

    b.   Problems Related to Physical Availability,

    c.   Problems Related to Content,

    d.   Problems Related to Evaluation Techniques,

    e.   Problems Related to School Administration,

    f.   Problems Related to Students Background Characteristics.

Problem Related to Class Performance and Physical Availability

The room is the place of knowledge delivery in formal education system of our country. In most of the subjects both the teachers and the students depend upon bookish knowledge. All the teaching learning activities are carried out from closed indoor environment. For the understanding of problems related to class performance the researcher observed ten different geometry classes in different schools by the help of class observation form, and found the mean weightage. Three point Lickert scale was made. To evaluate physical facilities the sub topics were: arrangement of class, light and ventilation, cleanness, availability of furniture, quality and availability of writing board and graph board, computer as teaching equipment. In terms of class performance the researcher had evaluated the following aspects: teacher's readiness, level of motivation and discipline, use of instructional materials, quality of content delivery, also the summarization of lesson, checking achievement of objectives and the quality of homework were evaluated as conclusion portion. Mean weightage derived from ten different classes are shown in the table below:

Table 4.1 Weightage Obtained from Class Observation

SN	Observed Items	Excellent	Good	Poor	Mean Weightage
1	Physical facilities				
	1.1. Arrangement of classroom	2	6	2	2
	1.2. The light and Ventilation	2	7	1	2.1
	1.3. Cleanliness	2	8	0	2.2
	1.4. The availability of furniture	1	6	3	1.8
	1.5.The quality of writing/graph board	1	7	2	1.9
	1.6. Computers as teaching equipment	0	4	6	1.4
	1.7. Mathematics Laboratory	0	3	7	1.3
2	Instruction				
	2.1. Teacher's readiness	1	6	3	1.8
	2.2. Level of motivation and discipline	1	6	3	1.8
	2.3. Use of instructional materials	1	5	4	1.7
	2.4. Quality of content delivery	2	7	1	2.1
3	Conclusion				
	3.1. Summary of lesson	1	6	3	1.8
	3.2. Checking the achievement of objectives	1	5	4	1.7
	3.3. The quality of homework	1	8	1	2

The above mean weightage of statements 1.6, 1.7, 2.3 and 3.2 have the mean

weightage less than 1.8 and hence there were problems in furniture availability,

quality of board, computer as equipment, availability of math lab, teacher's readiness,

level of motivation and discipline, use of advance and practical materials and evaluation techniques. The low average obtained in the statements 1.6 and 1.7 indicated that there is very less availability and use of projectors computers and other innovative instructional materials in most of the sample schools of this area. Content delivery, class arrangement, light and ventilation in the class and cleanness had better average in comparison to others. In case of homework most of the school gave much more homework. Which is not the excellent job but it is not too bad so it can be considered that there is average quality of homework. In case of content delivery, though there is good mean weightage students were not treated democratically. They were forcefully kept in rule and discipline and compelled to read and acquire the complex geometric concept.

'The teacher comes, writes facts, axioms, definition etc. and directly begins exercise. He goes on doing and tells us to copy, he also explains when we ask but in most of the content he doesn't explain detail that we want, he also revises the same explanation which worth very less to us so most of us feel boring in geometry class'. (Students)

At any cost students should pass the examination otherwise we should have to defense with the guardians and administration. Also we have to complete the bulky textbook having extremely more content, moreover there is no certainty of teaching days because of several reasons (schools extra activities, political strike, aftershocks, blocked etc.) so we have more tension than students in case of exam result. The job security depends upon the percentage of students passed in examination. (Teacher)

The above view of teacher and students suggested that there is problem for teacher and student both in teaching and learning due to the educational system and

political condition. Also the teacher's carelessness and lack of supervision by administration has played vital role in the problem related to geometry learning. It also seems that the book preferred is not by the teacher's choice. Private schools take terribly high fees from guardians so they have to make students pass with high marks at any cost. They have to select much larger books with high weightage to show themselves standard in comparison to others which forced teacher to teach horridly. In some extent lack of consciousness is also playing vital role in the above view of teachers. The reason behind this was found that math teachers in some school were part timer and seemed to be very busy and disturbed so that they couldn't create constructive and joyful class.

'I clearly complete the theorems by drawing figure and explaining definitions, axioms and related facts, revise the proof and ask counter question from the same exercise which is completely related to the theorem'. (Teacher)

'We are satisfied with the counter questions given by teacher as classwork and homework. In most of the case theorems also are clearly understood but we can't generalize it conveniently in all the cases'. (Students)

The above same view of teachers and students conclude that despite the better performances of the teacher there is problem in geometry understanding to the students. The problem behind this is less entering behavior of students, lack of practice of students, lack of practical material oriented and child centered teaching activities.

Problems Related to Content

Contents are the organized form of skills, attitudes and concepts marked by the objectives. On the basis of content the teacher efforts to develop all the things in students. Content is the main thing by which the standard of educational plan is represented. Contents should be designed in accordance with the nation's desire and demand, learner's desire, need, level and capacity.

To counter the problems related to content the researcher analyzed the responses of sample teachers asked in questionnaire. By finding mean weightage of responses he analyzed the problems related to contents.

4.2 Responses and Weightage Related to Mathematical Contents

SN	Statements	Responses			Mean
		SA	A	DA	Weightage
1.	Book is psychologically fit for the students	1	5	4	1.7
2.	Book is sound in regard to printing, parallel examples, exercises, and practice materials	3	6	1	2.2
3.	The volume of contents in the book is better enough for the estimated teaching period	0	3	7	1.3
4.	Additional parallel practice books and question collections are also used	7	3	0	2.4
5.	Exercises in the textbook are behavioral	1	3	6	1.5

The very less mean weightage in the statement 1, 3 and 5 obtained in the table above indicated that there was very enormous problem in content. Curriculum of mathematics and corresponding books didn't seem behavioral; they were not psychologically and chronologically better. The books were also of large volume with lots of examples and exercises so were not fit enough to complete in the estimated teaching period. The high mean weightage of statement 4 indicates that there is additional burden of question collection and practice books each and every student.
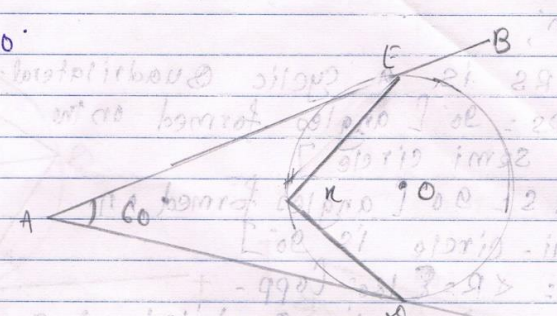
To analyze the problems related to content the researcher also took test of 200 students by instrumenting achievement test paper (Appendix III). Some major errors that students did are kept as one of the main base to analyze the problems related to content i.e. the problems related to contents were also analyzed on the basis of students achievement.

Reasoning portion contained the question related to central and inscribed angle, arc central angle and radius, cyclic quadrilateral, semi-circle, alternate segment angles and area of the triangles and quadrilaterals formed on the same base and between same parallels. These questions were completely based on the algebraic calculation of size of angles, length of radius, arc and area of the triangles and quadrilaterals. Students seemed to be able in calculating the angles related to the question having central and inscribed relation. Also the students seemed average in finding the area of triangle formed on the same base and between the same parallels with the parallelogram. The students who could not make even a single question correct also have written the reason or relation of angles correct but calculation of angles and placement of logic is not in correct way.

Seven questions were kept in reasoning portion. There were only 24% students who did all these questions correct without any errors. Remaining 45% did partially correct but tried all the questions. Though they tried their best the rest 31% didn't make even a single question complete. The paper below is one of the representatives of 45% students who made the reasoning portion partially correct.

Questions.   Reasoning

1) Soln:
   Given, ∠EAD = 60°

2) Soln: PO = 4cm, ∠POQ = 135°
   Now, $1° = \left[\dfrac{180}{\pi}\right]$

   Now, $135 = \dfrac{180}{\pi} \times 135$

   $= \dfrac{180}{\frac{22}{7}} \times 135$
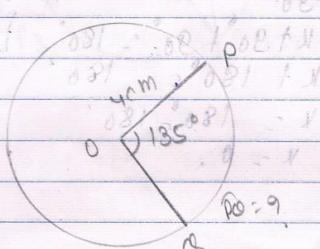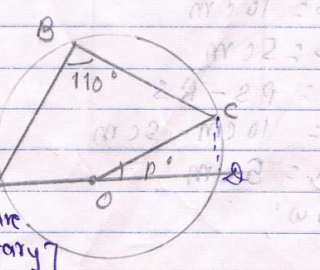
   $= 7,731.81$

   Now, $PQ = \dfrac{\theta}{\pi} = \dfrac{7,731.81}{4} = 1932.95$

3-) Soln,
   ABC = 110°
   Here, Construction: Join C & D
   ABCD is a cyclic quadrilate-
   ral. Now, ∠ABC + ∠ADC = 180°
   (opposite side of cyclic q. are
   in △ OCD   supplementary)
       ∠OCD = ∠OCD

d.) Soln,
Given,
∠CB = 60
∠CB = CBA [Alternate angle]
∠DBA = 90° [Angles formed on the Semicircle is always 90°]
Now,
60° + x = 90°
∴ x = 90° - 60°
∴ x = 90°

a. Given,
PT // OR
OS = 8cm

In Δ SQR
Area of Δ SQR = 1/2 × b×h
= 1/2 × b×8

e.) Soln,
PQRS is a Cyclic Quadrilateral
OPS = 90° [angles formed on the semi circle]
ORS = 90° [angles formed on Semi-circle is 90°]
∠P = ∠R = 180° [opp. t Sides of Cyclic Quadrilateral are Supplementary]
∠OPS = ∠TRN [angles formed on cyclic quadrilateral exterior]
= 90°
x + 90° + 90° = 180° [linear pair]
x + 180° = 180°
x = 180° - 180°
x = 0.

f.) Soln, Given,
AP = 6cm
PS = 10cm
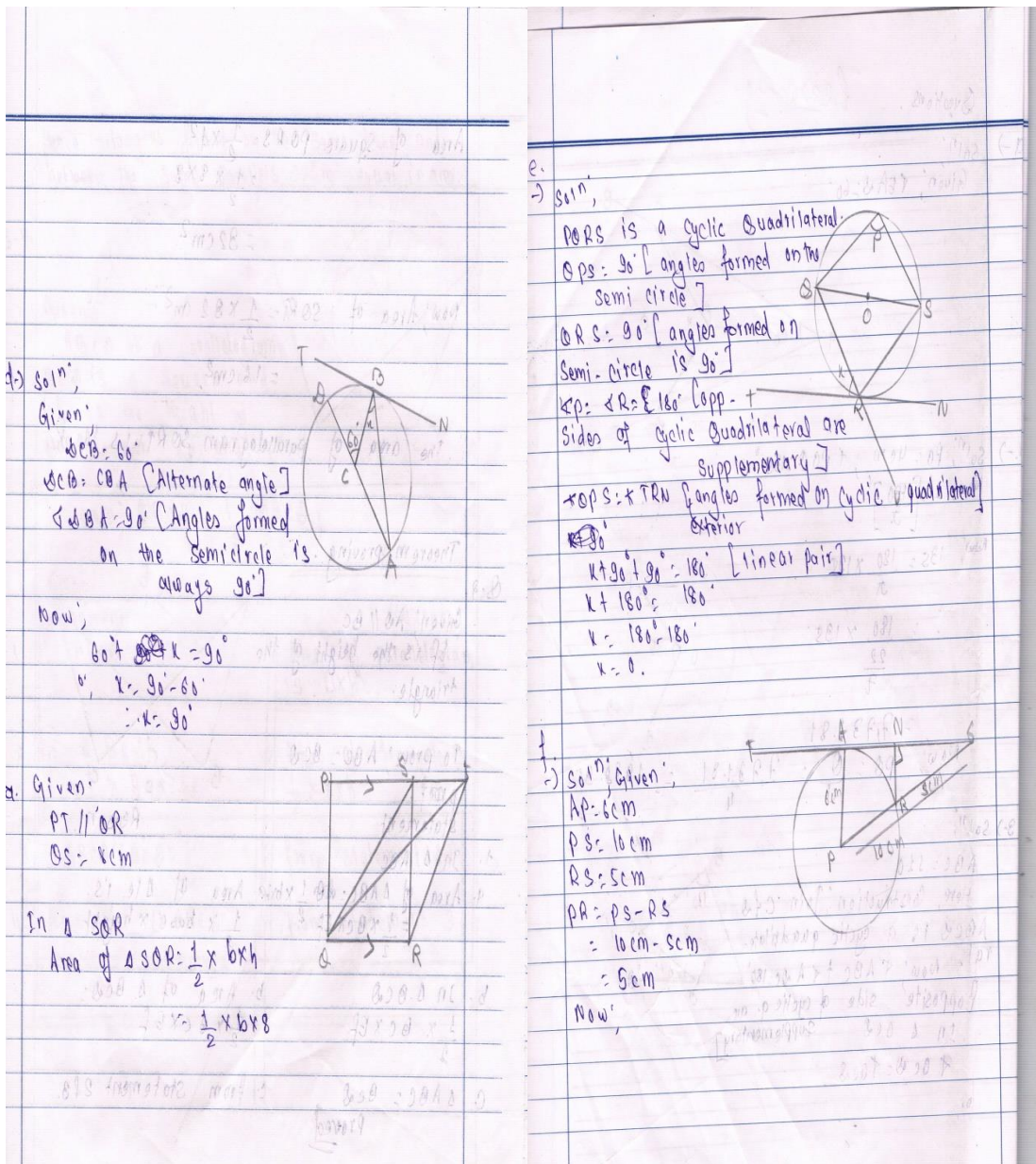RS = 5cm
PR = PS - RS
= 10cm - 5cm
= 5cm
Now,

Fig: I

Some of the students seemed to have very poor idea even to measure angle and distinguish the figure on the basis of angle formed. In some of the cases students seemed to write opposite angles of cyclic quadrilateral equal. Students also seemed to be confused in measuring two different inscribed angles therefore they have made the figure but left the table without feeling the angles. There were four questions in experimental verification (See Appendix III). About 32% students made it completely

correct, the remaining 61% also made it but they committed error in drawing the figure and somehow in measuring the angles. The remaining 7% student committed vital errors in drawing figures which showed that their level in geometry is too poor. Thus the performance of students in experimental verification is not sound. The paper below is an example of 61% students who did their best in verification but committed the significant errors.
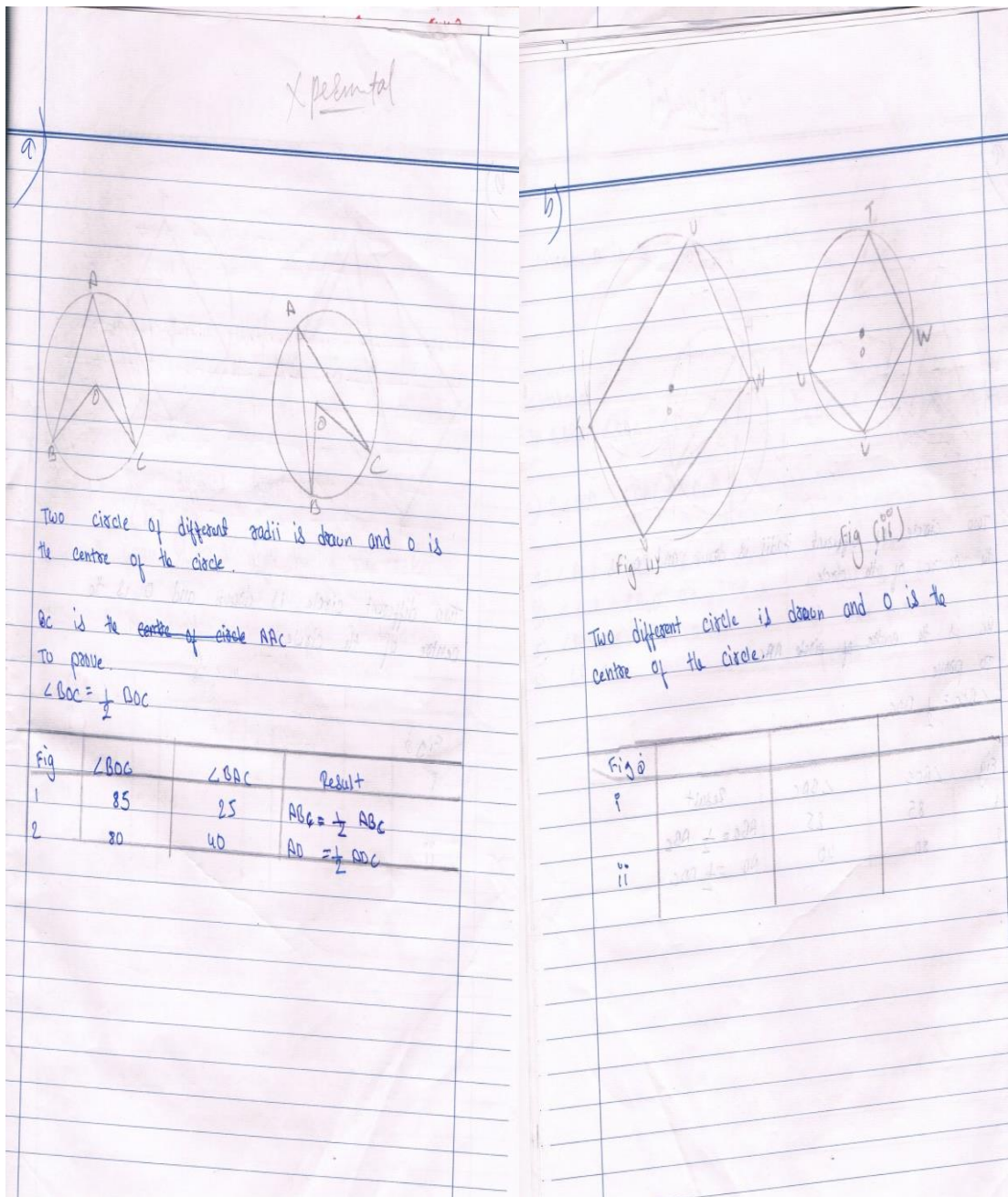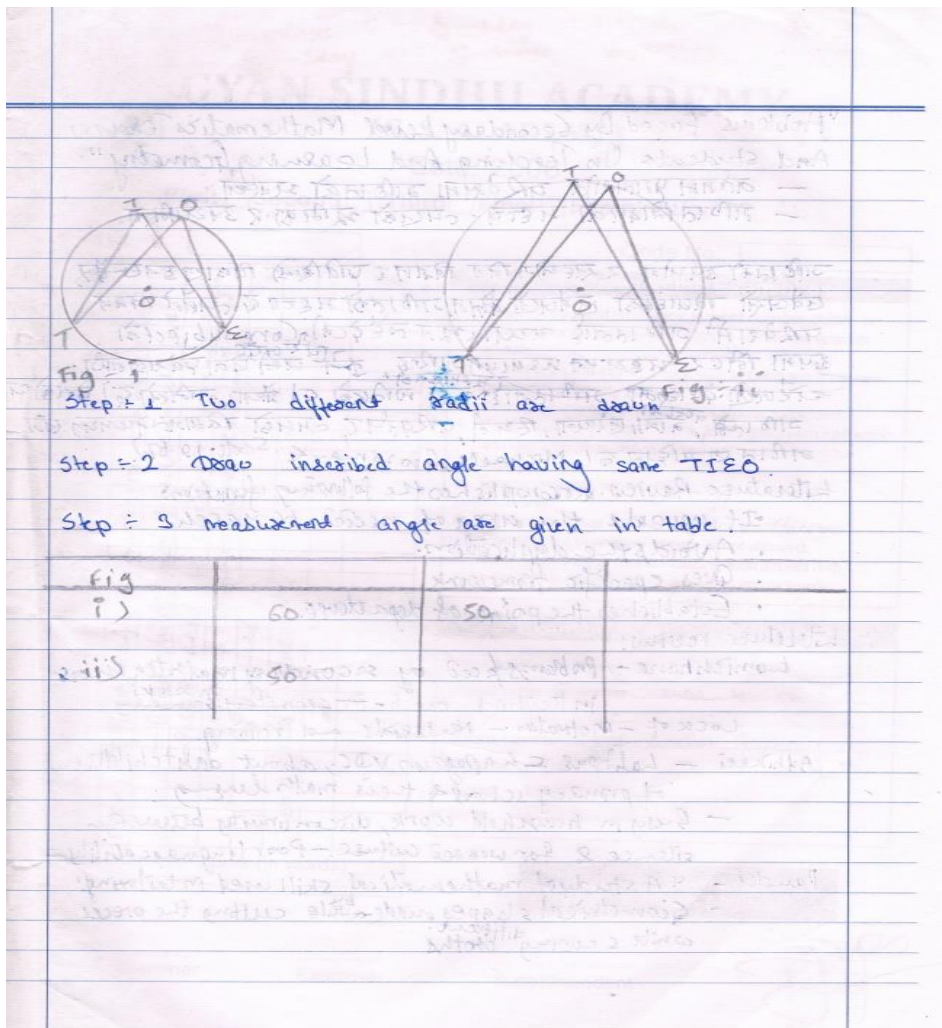
Fig: II

The Seen theorems were done by 40% students making it completely correct. Remaining 44% also did all the questions committing errors. The rest 16% have left the theorems by writing 'Given' and 'To prove'. There were only 4.5% students who completely proved all six out theorem submitting correct statement and logic. Theorem two and three were not done completely by remaining 95.5% students. Theorem one and four were done correctly by 59% students (omitting minor errors), remaining 41% seemed to be poor in theorem proving. Students have written the logic randomly which they thought to be correct in the figure. Most of the solutions do not seemed to be sequentially done; cause behind this can be the less conceptual idea of

students regarding theorem proving since the out theorem requires high ability to arrange the complex geometric structure by constructing the figure in solvable form. Following table is one of the representations of the solution of 41% students:
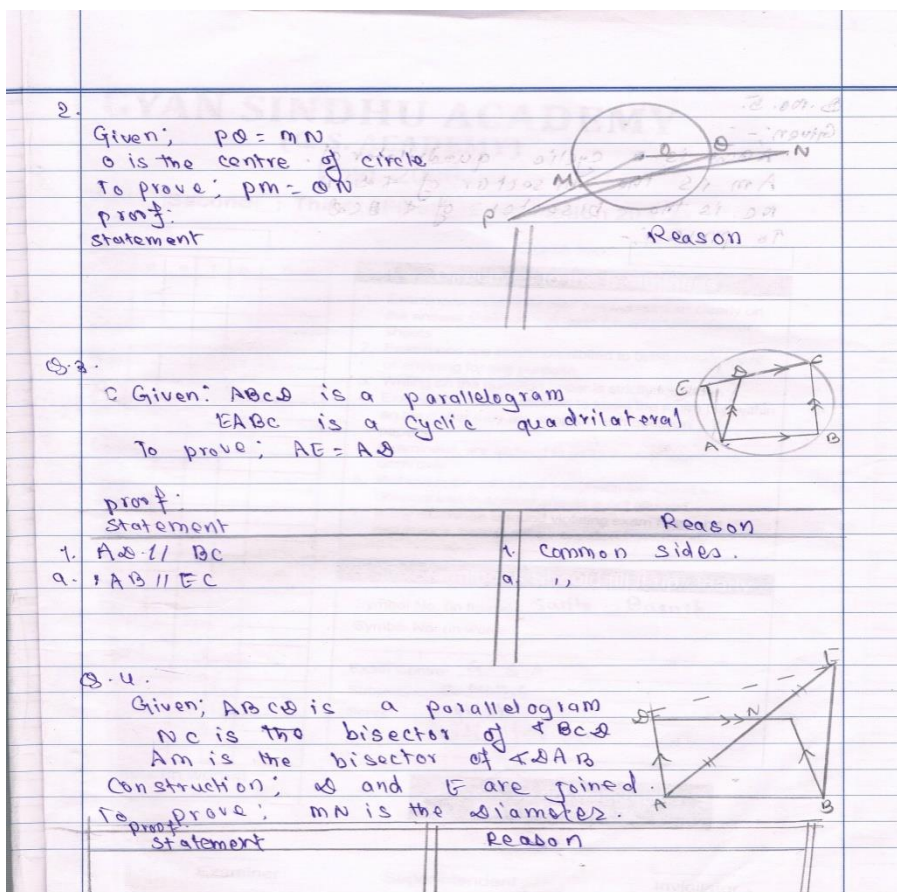

Fig: III

All the questions of construction were completely done by 14% students with significant reasons. The remaining 65% made it partially correct left 15% did completely wrong and rest 6% left the questions. While observing their answer sheet the researcher noticed that most of the students have very less concept even to construct angles. The students who did it partially correct were seemed to have less concept of sequence of construction and figure combination. Though they couldn't make the construction completely correct the students lying in 65% have shown their

very better performance while constructing the figures. Look the constructions below:

a) Construction.

Given
MN := NO = 5cM
OP = PM = 4cM
∠PMN = 60°
To construct := troaingle NPx equal in area to given quadrilateral.

Step 1 : Construct straight line MN of 5cm.
Step 2 : construct Draw an arc from N to O of 5cm and N to P 4cm.
Step 3 : construct 60° angle
Step -4 : Make arc in a ∠PMO equal to MPX and then cut equally
Step 5 : Join the line P to x and x to M.
∴ △PYM = quadrilateral NNOP

b) Given:
AB = 4cm
BC = 6.8cm
CA = 6.5cm
Construct := A rectangle equal in area to given triangle.

Step 1 : Join line AB of 4cm.
Step 2 : Make an ack from A to C and B to C and Join the line.
Step 3 : Make arc on B equal to C then Join the line from C to D and B to D.
∴ △ABC = rectangle ABCD.

c) Given,
KTM having each side 5·3cm.
Construction := quadrilateral equal in area to triangle.

Step 1 : Join line VM of 5·3c
Step 1 : Construct a equalation traing KTM having side 5.3cm.
Step 2 : Draw arc on f and equal arc on T and M.
Step 4 : Join the in point x from. N and T.
∴ △KTM = 47M Quadrilateral VTMX

d) Given:
GH = 5cM
IH = 4cm
∠H = 120°

Step-1 : Join line HG of 5cm. then. IH of 4cm.
Step-2 : Make 120° of Angle in H then Join the lile from H to S.
Step-3 : Make arc on G and I equally and construct line infinity.
Step-4 : Make angle 60° in G then Join it inside I line then Join

Fig: IV

Thus the achievement of students in geometry is not even satisfactory. The average achievement is poor in each and every portion of geometry as found by the achievement test. So the researcher concluded that there was problem in teaching and learning geometry due to the contents in the secondary level.

The researcher also submitted the teachers dissatisfaction for finding the problems related to contents. The following are some examples:

'In most of the contents of these books the teacher him/herself needs to practice regularly at home. I myself have been teaching since three years as secondary level math teacher, we had taught the book of Vidyarthi publication since five years, from this year we have followed the book of Unique which has made me too a complete school student. If I didn't look the coming content at home the quality of the class of that day decreases about thirty percent so the books are not better enough for poor students. Also the books cover high volume of contents which is good for knowledge but create real problem in practical field'. (Teacher)

The above view of teacher is sufficient to claim that there is enormous problem in content. The complex contents that are difficult even for the experienced teachers how they can be good enough for the students? Researcher also is agreed with the above view of teacher since he had also faced the same problems while teaching mathematics in secondary classes. Furthermore the complex concept and structure of construction and theoretical proof can decline the curiosity of learners. Furthermore the complex concept and structure of construction and theoretical proof were the main reasons to harass students.

Problems Related to Evaluation Techniques

To find out and analyze the problems related to evaluation technique the researcher took the base of all the evaluation techniques and strategies followed by the schools of concerned area. Classroom evaluation, monthly test, practical, open book test and terminal tests were the various test techniques followed by the schools. Mean weightage related to evaluation obtained from teacher's responses are shown in the table below:

Table 4.3 Responses Related to Evaluation Technique

SN	Statements	Responses			Mean
		SA	A	D	Weightage
1.	Result oriented test exam is in practice	5	4	1	2
2.	Practical evaluation is in practice	2	2	6	1.6
3.	Evaluation is democratic based on equity	2	2	6	1.6

The good average of statement 1 signifies that conducted examinations are not very formative; result is announced only by the help of written examination. Practical evaluation of students' performance related to material analysis, material construction and practical verification is not taken as the base of student evaluation also the differently able students were not cared properly and evaluated differently. This conclusion was derived from the less mean weightage of statements 2 and 3.

Practical works, terminal tests and open book tests were better constructive and motivating which emoted most of the students to take part in learning effectively. All these evaluations were done in successive planning but the result whatever comes

was not taken seriously i.e. poor students were not helped well. Therefore the researcher concluded that one of the significant problems behind the learning difficulty of geometry is narrow evaluation system of schools.

Problems Related to Administration

Researcher noticed teacher's stability, salary payment, trainings, materials' management, teacher evaluation and prepared the questions in interview form to collect the teachers' response, the researcher also talked with principal to find the ground reality of the problems related to administration.

Table 4.4 Responses of Questions Related to Administration

SN	Statements	Responses			Mean Weightage
		SA	A	D	
1.	Refreshment training is given regularly	o	4	6	1.4
2.	Instability of math teacher is very high	6	2	2	2.4
3.	Monthly salary is not attractive	6	4	0	2.6
4.	Administration is less responsible to manage instructional materials	5	5	0	2.5
5.	Weekly teaching period of a teacher is no more than 29	0	2	8	1.2
6.	There are no incentives to motivate the teachers to put in their best	6	3	1	2.5
7.	There are inadequate math teachers in terms of number and quality	3	6	1	2.2

The low average of statements 1 and 5 i.e., 1.4 and 1.2 represent that there is very poor condition of teachers' regular motivational training. The weekly teaching period of secondary level teachers' must be less than 29 which was not found in the schools of concerned area. Few math teachers had got 27 periods per week but they were also the level coordinator. The problem above is also supported by the response of statement 7 that is in most of the schools there were very limited mathematics teachers and were force to teach 33 periods per week (C. + O. Math grade 8, 9& 10).

The average of statements 2, 3, 4 and 6 are 2.4, 2.6, 2.5 and 2.5 respectively. They strongly support to write that monthly salary, incentives and other economic supports given to the teachers is very less which cannot motivate teachers to provide their best and serve longer in such institution therefore teachers' instability also was found high in such institution.

"I have just completed my master's degree, I have to collect experience, I will return back in my own hometown it is only my training center because I cannot do any progress by Rs.18000 per month". Teacher

"I am taking IELTS class in the evening. Teaching in this institution is only for my temporary economic support and use of leisure time". Teacher

From the above views of teachers one can conclude that teachers are not devoted in quality teaching due to various reasons, one of the main reasons behind this is very less salary and uncertainty of job security. Imagine what the above teachers give to the students! Therefore most strong reason for the poor quality delivery is the lack of proper behavior of administration towards teachers, in some extent nation's policy and condition also has played role for the above problem.

Problems Related to Students Background Characteristics

It is generally agreed that students' ability is dissimilar in learning math due to various backgrounds such as; maturity, socio-economic status, age, gender and intelligence level. Poor motivation and failure to provide insights related to meaning and method of content into students in mathematics learning is a main problem for the teachers. To counter the problems related to students' background characteristic the researcher visited the related locality, discussed with the guardians sufficiently, noticed the students' daily movement noticed the culture of the locality and collected the points for the teachers' interview on the problems related to student's background characteristics.

4.5 Response of Problems Related to Students' Background Characteristics

S N	Statements	Responses			Mean Weightage
		SA	A	D	
1.	Most of the guardians are engaged in academic occupation	0	3	7	1.3
2.	Social and Cultural diversity also has affected children in teaching learning activities	3	4	3	2
3.	Poor foundation of students in lower level poses problem in learning geometry	5	3	2	2.3
4.	Parents care children academically at home	1	6	3	1.8
5.	Economic status of all students is not strong	2	4	4	1.8
6.	Students are no longer interested in hard work	5	1	4	2.1
7.	Age and gender difference are also the factors creating difficulties in mathematics instruction	3	5	2	2.1

The mean weightage of the responses obtained from table 4.5 are analyzed and interpreted by the following points:

- Teachers and students both were of various cultures. In some school language and tone of teachers affected on quality delivering of geometric concept.

- Some of the guardians had planned their children to make actor, player, cook, beautician, or an army. That also was the vital reason behind poor geometry learning.

- The quality of students was very scattered. Some were extra, some were average and some were poor which affected on quality delivery of content.

- In most of the family both of the parents (father and mother) were engaged in work and were unable to care their child at home properly those children were poor in all the subjects.

- Very less guardians of this locality were engaged in academic occupation which impacted directly in children's geometry learning.

Researcher also spent one-one Saturdays in the hostel of three schools (Gyan Sindhu, Mount Glory and Saptagandaki School) for this purpose and he found that the students in hostel were kept in discipline and rule but they were less helped academically, almost the students were poor in math. The wardens employed were under bachelor in science in all these three schools. And none of them were capable in geometry.

The following are the guardians some responses to the questions related to students background characteristics

'My child was not so talent in mathematics even in the junior classes, because of the less previous concept now she is facing problems in learning geometry'.

'He is our single child we think not to make him sad; he misuses our affection and neglects practicing any content'.

'We have planned to make him an army, his father is also army officer so we focus him in physical and give less burden of content'.

The above mentioned view of parents helps to conclude the researcher that there are noticeable problems related to students' background characteristic that directly and indirectly create the problems in geometry learning. Some of the problems are like as challenges to the school administration to solve. If the future plan is less related to academic qualification then the child neglects in reading which directly effects in his quality. Some of the child seemed to be stubborn whom the school had admitted by the force of shareholder, they disturbed others too. The poor base of students in junior classes is also the threats to be addressed.

The researcher asked some questions to the selected guardians and teachers for finding the probable solutions of the problems stated above, from their response and suggestion researcher concluded that the meaningful and significant address to the problems stated above is supposed to be the probable solutions of the problems. By reading various related books, attending in different workshops, discussing with teachers, school administration and by the help of supervisor the researcher have prepared the following techniques to obtain the probable solutions of the problems faced by secondary level teachers and students in teaching and learning geometry.

II. Remedial Factors:

a. Writing in Geometry,

b. Problem Solving in Geometry,

c. Group Investigation in Geometry Learning,

d. Communication,

e. Using Locally Available Materials,

f. Administrative Strength.

Writing in Geometry

Writing is a unique mode of learning because it connects three major tenses of our experiences to make meaning by shuttling between past, present and future (Emig, 1983 cited in Menon, 1998, p.19). In general, there are two types of writing in mathematics known as formal and informal. The formal writing comprises of writing geometric proofs, description of experimental verification and solution of mathematical problems. In formal writing, the students should use appropriate symbols and metaphors to represent their ideas. Of course, the expected outcome of school curricula is to develop the skill of formal writing. The informal writing does not seek to use the appropriate format as in formal writing. In most of the cases the informal writings are all about the reflection of understanding of learning. To minimize the problems related to logical reasoning of students the teacher should focus the students in writing facts and definitions as the very basic concept of geometry learning.

Problem Solving in Geometry

One of the objectives of school-mathematics is to develop problem solving abilities of the learners (Curriculum Development Centre, 1999). Problem solving is regarded as a learning activity in which opportunity is provided to the learner to apply the understanding of concepts and to be trained to think creatively (Schoenfeld, 1992). Regarding the importance of a mathematical problem Stanic and Kilpatric (cited in

Schoenfeld, 1992) have identified five roles that problems play, which are: as a justification of teaching mathematics, as specific motivation for subject topics, as recreation, as a means of developing new skills and as practice (Schoenfeld, 1992, p 338). Furthermore problem solving is one of the dominant strategies used in mathematics teaching and learning for many years.

Broadly speaking, problem-solving strategy is carried out in four steps. Firstly, problems or problematic situation is created, secondly students have to work in their group to find the solution, thirdly they put their solution ahead of the class and fourthly, a discussion is carried out to discuss about the problem and solution. In such a case sometimes the problems use to be open-ended; and students have to investigate for the multiple solutions. This approach enables students to understand the problem clearly, search for the possible method for solution, solve the problem sequentially, evaluate it and generalize in similar context.

Group Investigation in Geometry Learning

Group-investigation is one of the strategies to be implemented for improving teaching and learning situation in Nepalese schools. There are three advantages of group investigation such as, group investigation helps the students get into the learning situation; it gives an opportunity for the learners to develop more socially accepted ideas; and it promotes communication and interaction among the learners. Furthermore, when students work together on mathematical problems, they express the positive views about mathematics, are more likely to be engaged, and show internal motivation to do well (Steele, 1993; cited in Pandiscio, 2001).

This technique can be very effective even in the context of public and private both schools. It can be the successive idea to motivate students in learning geometry.

Communication

Our curriculum does 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). Communication also concerns with the language between teachers, students and content which is one of the primary matter in the context of our schools having several ethnic languages. In order to minimize the problem teachers and students can construct a set of glossary of local languages (Koirala, 2000) which can be useful in easy learning of geometric concepts.

Using Locally Available Materials

The immediate solution of crowded classrooms, limited space and lack of teaching-learning multimedia and software is the use of locally available materials. The wax, match-box, newspapers, bamboo, wooden models are the examples of locally available materials. An activity planner can prepare to collect, develop and store the teaching materials. Students themselves can collect and construct different solid models. Similarly from the bamboo, they can prepare a set of virtual-two-dimensional shapes. The teacher can motivate the students to maintain a math bag at home in which they keep all the manipulative instructional materials they have made while learning. This technique of constructing low cost, no cost or locally available

materials helps to minimize the material problem in school and motivates students in participatory learning.

Administrative Strength

This topic concerns with the administrative idea to run the institution. Strong physical management, attractive salary to the teachers, perfect academic schedule and implementation, successive supervision, evaluation and encouragement to the teachers etc. can be the possible techniques to minimize the problems related to administration.

Conclusion

The major factors creating problem in teaching and learning geometry were materials, methods, language, level of students and administration. Above mentioned techniques can be contextual, behavioral and applicable in almost all of the schools of our country and therefore even in Tokha Municipality.

Chapter V

SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Researcher here submits the summary, major findings, conclusions and recommendations derived from the research work.

Summary

The main purpose of the study was to identify the problems faced by the mathematics teachers and students regarding their teaching learning activities related to geometry portion. The specific objectives of the study were to:

- identify the factors that contribute to the difficulty in teaching and learning of geometry.
- suggest the probable strategies that could remedy the difficulty in the teaching and learning of geometry.

For the convenience of the study the problems were categorized into different 6 areas, viz. problems related to content, problems related to class performance, problems related to physical availability, student evaluation technique, administration and students background characteristics.

The study was entirely survey type. The population of this study consisted entire mathematics students and teachers of private schools of Tokha municipality. The researcher developed the class observation form, interview schedule and achievement test paper under the strong guidance of supervisor. The researcher added some significant problems himself with the advice of experienced mathematics teacher of concerned topic. The class observation form, interview schedule and test

paper were the major tools of the study. The responses were collected from teachers, parents and students which were selected from simple random sampling method. Some of the collected data (from class observation and interview) were quantified on the basis of Three Point Likert Scale and analyzed on the basis of mean score. Students' achievement obtained from test paper and responses of guardians were analyzed on the basis of different themes determined earlier in the conceptual understanding.

Findings

From the field survey and statistical analysis of collected data it was found that the students and teachers have been facing lots of problems of geometry teaching and learning in the mathematics class of secondary level. Different types of internal and external forces play role to continue the problems. On the basis of analysis and interpretation of data the findings are stated below:

Problems related to class performance

- There was problem on solving parallel questions related to exercise due to the large volume of book and short teaching period (40 minutes).
- There was problem on child centered instruction because the course was to be finished before Dashain, also this year due to the devastating earthquakes and unannounced blocked of India teaching periods were deduced nearly 40 days.
- There was problem related to sound management and effective use of instructional materials.
- In most of the classes of sample schools very less number of students was only able to understand the geometrical theorems conceptually.

- Due to the weakness of perfect entering behavior most of the students were not satisfied with the logics given by teachers while proving theorems.

- Also there was problem in home work checking, teacher just look through the copy of poor students, advice orally and hurry to complete the chapter.

- Students were kept at school from six in the morning to six in the evening so they were fed off of learning, also they could get very less time for home task.

- In four sample schools math period was at sixth bell which could help students very less on learning math curiously.

- In some of the schools math teacher was new and had taught each and every theorems of book in grade ten whereas only six theoretical and four experimental proofs as seen theorems were sufficient.

Problems Related to Physical Availability

The researcher has submitted the following points to support the above statement.

- Though there were no more students in the classes, the room was not large enough even for the less number of students for proper teaching learning activities.

- Lots of the classes were disturbed by the sound of next class and also of vehicles on the road beside the school

- Some of the students and teachers in some school were frightened and not fresh enough to study in the room of bamboo and tin also the regular aftershock affected the study dangerously.

- Available mathematical instructional materials also were not used, teacher only discussed about them without showing practically.

- Science lab, library and computer room seemed as they were not made for practical mathematics. No separate math lab was found even in single school of concerned area.

- Guardians were found to be hoping high marks in mark sheet especially in math, science and social studies.

Problems Related to Content

The researcher had asked with subject teachers and also analyzed the geometric portion of all different books preferred in the different schools of this area to analyze the significant of content and the following problems were noticed:

- Almost all the textbooks were highly standardized with sufficient questions, practice materials and were very large in volume.

- In some of the books examples and respective questions were not parallel.

- Some of the books were not fit enough on the basis of difficulty level of students.

- Achievement in geometry was not even satisfactory. (See page 30-35).

- Structural complexity and more theoretical (less practical) nature of geometry also were found to be the cause of problems.

Problems Related to Evaluation Techniques:

Most of the schools conducted regular monthly test to evaluate the progress of students', home task were given and regularly instructed for perfect note at almost all of the schools. All the students of grade nine and ten had at least one practice book or question bank. Only the written test as the evaluation tool couldn't measure the verbal capacity, experimental talent and logical manipulation idea of solid objects of students which resulted fail to the more students. Therefore researcher also found the problems related to evaluation technique.

Problems Related to School Administration:

- In almost all of the concerned schools the researcher found that the teachers were forced to teach at least 32 periods per week which directly affected the quality delivery of complex geometrical content.

- In comparison very less guardians of this area were engaged in academic occupation which could effect on children's mathematics learning.

- Refreshment and new comers teacher training related to content by experts were not managed at most of the schools. Trainings were held in some of the schools but no trainings were there on the content basis of any subject.

- Salary also could be the cause of less energy while making teaching plan. (it was noticed by researcher in informal discussion with some math teachers)

- Leisure periods of teacher also were pack with proxy classes in most of the schools because number of teachers was very limited.

- The instability of teachers also was noticed as one of the strong cause for the poor result of mathematics.

Problems Related to Students Background Characteristics:

- The talent of students was very scattered. Some were extra, some were average and some were extremely poor which affected severely in quality delivering of complex geometric concept.

- Students were from various cultures and also were the teachers therefore in some of the schools of this locality language and tone also affected the quality instruction in some extent.

Conclusion

Most of the schools in Kathmandu valley contain multicultural and diverse classroom also the students of various level and aim. Diverse classroom have diverse

expectation and diverse ability of learning. Geometry itself has complex structure so it is challenging to teach geometry in such classes. The teacher should be aware of all the differences, well habitual about innovations related to methods and media and also the practices of school and society. The administration and the teacher should be equally responsible to create constructive and sound instructional environment. They can manage the proper contents, methods; materials, physical environment and can promote the positive discrimination and inclusive participation. Some teachers seemed to focus only talented students it is due to their ignorance rather than the intended bias, discrimination and the prejudices in math teaching. These drawbacks or ignorance caused by a math teacher is due to the lack of trainings and expertise to handle the classroom. The teacher should encourage the average and poor students and follow various techniques of teaching to minimize the learning difficulties. Classwork checking, homework correction, interaction in the class, role play, and active participation in mathematics classroom is the key points to promote instructional strengths.

Taking mathematics subject as an interesting and teaching it with fun, suggesting students for solving problems in pairs, individual support to the weak students, division of the student groups according to their talent and equal treatment from teacher were the good examples of encouragement that was fructifying the geometry instruction.

Recommendations

For the probable remedial measures the researcher asked to the selected guardians of the schools. The researcher also talked with the teachers, principals and took the suggestion of supervisor for the correct and behavioral solution of the above

problems. The researcher had also read the previous research documents which included practical effort and suggested to apply various techniques to achieve the goal despite the problems stated above. The following are the recommendations presented in the basis of above aspects:

Recommendations to Address the Problems:

- Positive learning environment and learning behavior should be managed

- Use of paradoxes in teaching and learning of mathematics can generate curiosity, increase motivation and create an effective instructional environment. *(Dikshya Yearly 2072, p. 31)*

- Mathematics teacher should be well known about the curriculum referred by CDC.

- Teachers should make lesson module of each and every chapter before teaching.

- Classes should be well equipped with new innovative instructional equipment.

- CDC should provide perfect training advance instructional materials related to content, also should observe the implementation.

- Teachers should use various student participatory teaching techniques as presented in remedy section.

- Workshops on various portions of geometry should be conducted effectively.

- Motivational orientation program should be conducted.

- Books must be with parallel and sequential examples and exercise also with error free as far as practicable.

- Teachers should be honest to their job and responsible for the academic progress of each and every student.

- Administration should be responsible and sound regarding salary payment, materials management and their effective uses.

- Project works should be given to the students in different geometric topic.

- Coaching classes must be the supportive classes for the classes of the day, not the separate one.

- Teacher's instability and physical disturbances should be minimized currently by the administration.

- Parents should give sufficient time for their children also they must be creative critic for the academic progress of school.

- Sufficient teachers should be managed at school so that no teachers feel tired in any classes and he can give the classes effectively.

Recommendation for the future uses:

- Parallel researches in junior or senior level, in other topics or in other locality by taking large sample of population can be carried out.

- This survey will help to know the true condition of secondary level geometry teaching learning in the academic session 2072 of Tokha Municipality.

- Concerned individuals, institutions or offices (curriculum designers, book writers, resource persons, teachers, students, guardians, administrators, schools, publishers, resource centers, DEO, CDC etc.) will be benefitted by this research.

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APPENDIX-I

Class Observation Form

SN	Observed Items	Excellent	Good	Poor
1	Physical facilities			
	1.1. Arrangement of classroom			
	1.2. The light and Ventilation			
	1.3. Cleanliness			
	1.4. The availability of furniture			
	1.5.The quality of writing board and graph board			
	1.6. Computers as teaching equipment			
	1.7. Mathematics Laboratory			
2	Instruction			
	2.1. Teacher's readiness			
	2.2. Level of motivation and discipline			
	2.3. Use of proper materials charts and pictures etc.			
	2.4. Quality of content delivery			
3	Conclusion			
	3.1. Summary of lesson			
	3.2. Checking the achievement of objectives			
	3.3. The quality of homework			

APPENDIX II

Respected teachers,

I am a master's degree student of Mathematics Education Central Department of Education Kirtipur, Kathmandu. I am writing a thesis entitled "Problem faced by secondary level teachers and students on teaching and learning geometry" as the partial fulfillment of my degree graduation. Teaching learning activities couldn't be effective without identifying the actual problem of teachers in teaching. So to complete this thesis I have prepared achievement test paper which is prepared for the students of grade ten. Researcher will give you a questionnaire form to fill and observe your class. Researcher will be very thankful for your valuable help. The information obtained from you will be used for this study. Test papers and your answers will be kept secret.
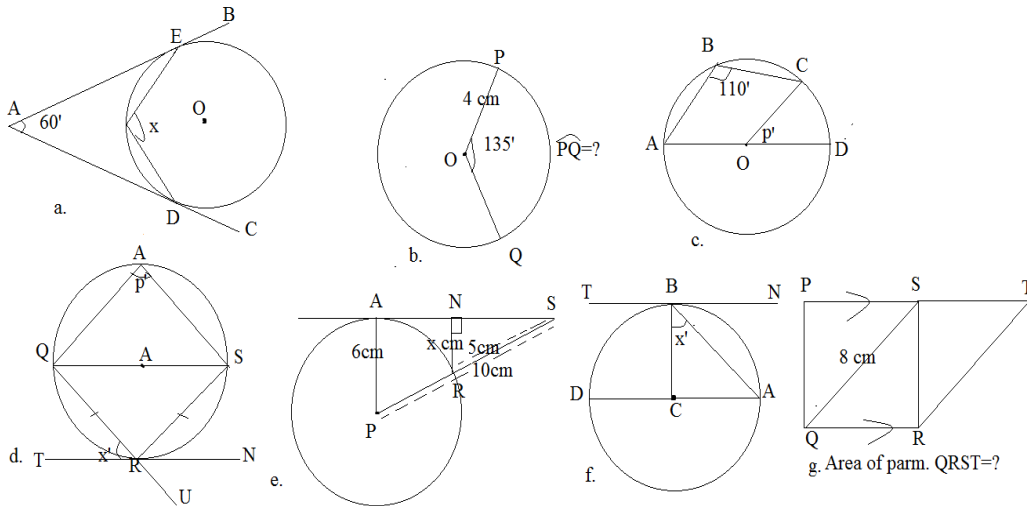
Researcher

Shankar Puri

Department of Mathematics Education

Test Paper

Reasoning
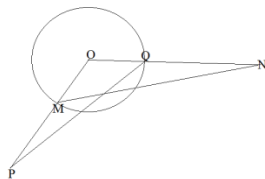
Find the values of unknown sides or angles.

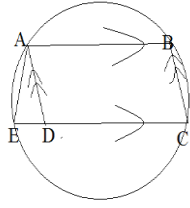**Theorem Proving**

a. Seen Theorems

1. Prove that 'Inscribed angles of a circle formed on the same arc are equal'.

2. 'Inscribed angle of a circle is half than the central angle formed on the same arc' prove the statement.

b. Out Theorems

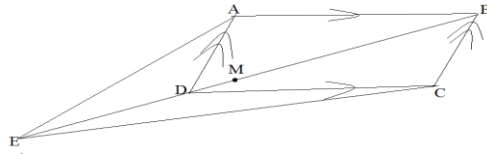3. In the given figure if PQ = MN, prove that PM= QN.

4. In the given figure ABCD is a parallelogram and EABC is a cyclic quadrilateral, prove that AE=AD.

5. In the given figure M is the midpoint of AE, ABCD is a parallelogram, prove that triangle ABE and parallelogram ABCD are equal in area.

Experimental Verification

6. Verify experimentally that 'Inscribed angle of a circle is half than the central angle formed on the same arc' (two circles with radius no less than 3cm).

7. Verify experimentally that in a cyclic quadrilateral TUVW, angles TUV and angles VWX are equal by drawing two circles of significant size.

8. Verify experimentally that 'Inscribed angles of a circle <TIE and <TOE are equal'. (Two circles with radius more than 3cm are required).

Construction

9. Construct a quadrilateral MNOP in which MN=NO=5cm, OP=PM=4cm and <PMN= 60°. Also construct ΔMPX equal in area to the given quadrilateral.

10. Construct a triangle ABC having sides AB=4cm, BC=6.8cm and CA=6.5cm. Then construct a rectangle equal in area to the given triangle.

11. Construct a triangle KTM having each side 5.3cm and construct a quadrilateral equal in area to the given triangle.

12. Construct a parallelogram GHIJ having GH=5cm, IH=4cm and <H=120°. Also construct a triangle having an angle 60°.

APPENDIX IV

Name of the sample School, Number of Teachers and Students

SN	Name of the schools	Number of mathematics teachers	Number of secondary level students
1	Greenland S. E. School	1	25
2	J. B. Memorial School	1	20
3	Mount Glory E. School	1	20
4	Active Academy	1	25
5	Southwestern School	1	10
6	Divyakanti E. B. school	1	15
7	Kamana H. S. school	1	20
8	Saptagandaki B. school	1	10
9	G. S. Academy	1	30
10	Floriscent E. B. School	1	25
	Total	10	200

APPENDIX V

Interview guideline to the teachers on factors responsible for the difficulty and suggestion measures in the teaching and learning of geometry in secondary schools

S/N	Items	Responses		
		SA	A	D
1.	Book is psychologically fit for the students			
2.	Book is sound in regard to printing, parallel examples, exercises and practice materials			
3.	The volume of contents in the book is better enough for the annual estimated teaching period			
4.	Additional parallel practice books and question collections are also used			
5.	Relation between mathematics exercise in book and mathematics in behavioral context is significantly strong			
6.	Result oriented test exam is in practice			
7.	Practical evaluation is in practice			
8.	Evaluation is democratic based on equity			
9.	Refreshment training is given regularly			
10.	Instability of math teacher is very high			
11.	Monthly salary is not attractive			
12.	Administration is less responsible to manage instructional materials			
13.	Weekly teaching period of a teacher is no more than 29			

14.	There are no incentives to motivate the teachers to put in their best			
15.	There are inadequate math teachers in terms of number and quality			
16.	Most of the guardians are engage in academic occupation			
17.	Social and cultural diversity among teacher and students also has affected children in teaching learning activities			
18.	Poor foundation of students in lower level poses problem in learning geometry			
19.	Parents care the children academically at home			
20.	Economic status of all students is not strong			
21.	Students are no longer interested in hard work			
22.	Age and gender difference are also the factors creating difficulties in mathematics instruction			

APPPENDIX VI

Interview Guidelines for Parents

a. Occupation

b. Expectation of parents towards their child

c. Home environment

d. Support and guideline at home

e. Guardians view as suggestion.