Chapter I

Introductions

This chapter begins with its introduction parts highlighting the background of the study, statements of the problems, significance of the study, objective of the study, research question, delimitation of the study and definition of the key terms are used.

Background of the Study

Mathematics is taken as a process of learning and interpreting the natural phenomena of each individual. It has been explained in other way as knowledge of numerical and calculation of part of human life. The societies in which we live have undergone rapid and widespread technological change in recent years. Information and communication technology (ICT) permeates our whole life including work, learning, leisure, relationships etc. Digital literacy will, if it does not already, undoubtedly play a significant role in our future lives (Allen, 2007).

The National Education Commission (NEC 1992 AD) NEC has introduced one hundred full marks of mathematics, out of seven hundred in primary level. Similarly One hundred full marks Out of seven hundred fifty in Lower Secondary Level and compulsory Mathematics of one hundred full marks and additional mathematics of one hundred full marks for interested students out of eight hundred in secondary level. Mainly there are three parts divided in Mathematics such as Arithmetic, Algebra and Geometry .They work different area of mathematics, Geometry is the famous part of mathematics but it has difficulty in attracting new generation towards geometry. So there are different ideas of teaching Geometry. Basically Teacher should be creative to decide whether the instructional material can be used or not in teaching process. Instructional materials can include, textbook, hand

outs, worksheets, video and audio tapes, computer software and visual aids. They influence the content and the procedures of learning.

Regarding it, Johnson (1978) asserts; "Instruction materials are as an essential for the mathematics teacher as spices are for the chef. They are necessarily extra ingredients that make teaching and learning mathematics pleasant satisfying experience model, pamphlets, films given to that would be difficult to obtain in any other way" .Geometry is considered as a tool for understanding, describing and interacting with the space is perhaps the most institutive, concrete as well as reality based mathematics. Other aspect of mathematics and is capable of being extended for further generalization.

The word Geometry is taken from the Greek word 'Geometrian' which means "measurement of earth" It is the study of spatial concept. In ancient time the nature of geometry was informal and practical but now a days it's nature is more formal. Also the space which student can easily understand Euclidean space because it is related to student life. Mathematics is the directly associates with human life and is necessary for human civilization. It is proved that human civilization and development of mathematics comes together, mathematics is playing vital role to development of human civilization.

In the 21st century, the activities of human are depending on technology. Cellular phones, text messaging, email and social media are primary tools of communication for human civilization. Computer, cell phone, projector, virtual class, internet and so on terminology can be used to learn the mathematics with the enjoyment way of learning mathematics. Educationists, teachers, psychologist and parents all have trying to attempt to explain how a child can learn batter. The interest of child is very important to create the learning environment. Our children are very

closed to the technology if we provide or share knowledge with technology students feel interesting and able to learn more.

In the teaching and learning of mathematics, it is important for the student to be able to imagine, construct and understand construction of shapes in order to join them with the related facts. So the computer assists students in imagine and making observation. So many tools and software are available in the field of mathematic such as Geogebra, Matlab, Mathematica.

The multi-platform, open-sources mathematical software Geogebra is useful software, which can use in the mathematics classroom to encourage investigation, discovery, and show the concept in dynamic way and to visualize the concept in geometrical figure. By utilizing GeoGebra in teaching, students learn through exploring, investigating and discovering source. GeoGebra enhance student's higher order thinking skill in mathematics. It is an effective tool for teacher and students. GeoGebra is the software, which can help the student as well as teacher to learn and explore knowledge in the required location. NCTM (2000) states that: "The effective use of technology in the mathematics classroom depends on the teacher. Technology is not a panacea. As with any teaching tool, it can be used well or poorly. Teachers should use technology to enhance their students' learning opportunities by selecting or creating mathematical tasks that take advantage of what technology can do efficiently and well - graphing, visualizing, and computing". Different type of figure and concept are including in problems can be solved in short period of time and problems solving method are different and more example also including so it is useful for the mathematics learner's.

According to Hohenwartert(2008), GeoGebra is computer software for mathematics for learning geometry, algebra, calculus at kindergarten to university

level. Thus, GeoGebra is dynamic and easy to use and interactive as well able to solve the problems in different and unique way in which way student have engaged in attractive demonstration, construction and explorations that are not available through paper -cutting geometry. Atiyah (2001) refers to geometry and algebra as 'the two formal pillars of mathematics'. GeoGebra is an attempt to join these pillars, which other packages treat separately, into a single package. The basic idea of GeoGebra is to provide a dynamic software that incorporates geometry, algebra, and calculus and treats them as equal partners thus enhancing the teaching of mathematics through enabling learners to gain stronger links between geometry and algebra (Hohenwarter and Jones, 2007; Hohenwarter and Lavicza, 2007)

Statement of the Problem

Nepal is a developing country, which is still back ward to use the technology for teaching and learning mathematics. The government of Nepal emphasizes integrating technology in teaching and learning mathematics (MOE, 2007). But, in practice low emphasis and encouragement prevails rather than the integrating technology in exploring mathematical idea and concepts. Still most of the Nepali mathematics teachers are unable to apply the technology in mathematics classroom due to their insufficient skill. Very few schools are in the access of technology. In facts the school is dominated by traditional pedagogy. Exam oriented output and parrot learning approach is very closed with the teachers and students. In an effort to provide an opportunity in the current situation, the teaching approach must be under the technology i.e. with the mathematical software GeoGebra to teach the geometry in our school; kindergarten to the University level.

The importance of mathematics education is not to make the students pass the exam, the teachers need to focus in the process than product which process as students

can share to friends in the correct way and get the discussion among mathematics lovers. Many educators and non-educators believe that the use of GeoGebra as the part of curriculum is superior then other pedagogie(Kulik,1994). Most f the teachers and students said geometry is difficult subject. To overcome this research is intended to determine to the effect of GeoGebra assist instruction and traditional method. The experimental research questions this study will intend to answer the following questions:

➢ Does the use of GeoGebra more effective than the traditional Method?

➢ Differentiating the student view in GeoGebra in learning parallelogram and circle of geometry?

Objectives of the Study

The main objective of the study was to find the effectiveness of GeoGebra in geometry teaching. This research was accomplished by the following objectives:

➢ To compare the achievement of students taught by using GeoGebra and traditional learning method in teaching parallelogram and circle of geometry.

➢ To analyze the students attitudes towards GeoGebra in teaching learning parallelogram and circle.

Hypothesis of the study

We cannot take a single step forward in any inquiry unless we begin with a suggested explanation or solution of the difficulty, which originated it. Such tentative explanations are suggested to us by something in the subject-matter and by our previous knowledge. The research activities are planned to verify the hypothesis and not to find out the solution of the problem or to seek an answer of a question. It is very essential to a research worker to understand the meaning and nature of

hypothesis. The researcher always plan or formulate a hypothesis in the beginning of the problem.

Research Hypothesis

The GeoGebra assist instructions provide effective result in term of the achievement of the student in Geometry to comparison traditional method.

Statistical Hypothesis

The null and alternative hypothesis of post-test:

H_0: $\mu_1 = \mu_2$ (There is no significance difference between the achievement score of experiments group and control groups of post-test.)

H_1: $\mu_1 > \mu_2$ (The average achievement of the student at mathematics of experimental group is higher than the average achievement of the student of mathematics of control group.)

(Where, μ_1 is the achievement of the experimental group and μ_2 is the achievement of the control group.)

Significance of the Study

The significance of the research has given below:

- Finding of this research has helped the mathematics teacher to improve their teaching strategies.

- Manage the ICT based classroom and apply the technology in the teaching pedagogy.

- As the curriculum designer might be help to develop the technology base curriculum.

- Teacher can understand the problems and can solve the problems in the different way and make the concept clear to the student.

- Student may understand and visualization of the geometry and solve the problems.

- The GeoGebra assist instructions provide effective result in term of the achievement of the student in Geometry to comparison traditional method.

Delimitation of the Study

The study would have following delimitations:

- This research focused on grade ten Mathematics, Geometry part only.

- This research used achievement test and survey questionnaires only.

- This research had focused on the effectiveness of GeoGebra only.

- The experimental period was just ten hour only

- The study had conducted to compare the effectiveness of GeoGebra assist learning and Expository learning method only.

Operational Definitions of the Key Terms

ICT based learning method. This is the technology based learning method where we can use different types of software to make the concept clear and will also use to solve problems. Where student will take the active participation and try to solve the problems by themselves and will discuss with their friends. Student can learn the mathematical content according to their capacity and will get the chance to practice more themselves. The role of teacher is just facilitator.

Traditional Method. In this study traditional method represent a teaching strategy in which the teacher constructs and organizes the subject matter and explores everything himself. The teacher uses lecture method, most of the time as well as time to time uses question answer method. In this method, teacher is the main role model of the learning method.

Effectiveness. It is defined in term of change in score, change in motivation, regularity of the student, regularity of HW and CA of mathematics. More precisely, in this study effectiveness included: Increase the average achievement in mathematics Education, Make the student familiar with the technology.

Experimental Group. A group of students which is Explore and use of Geogebra regularly, while teaching in the geometry class.

Control group. A group of students who will get the regularly instruction in knowledge transformation without using technology.

GeoGebra. GeoGebra is the dynamic software which can help to visualized the concept

Descriptive of Variables

Independent Variable. ICT based learning method

Dependent Variable. Score in academic test in the subject and perception of the student in the Geogebra.

Controlled Variable. Teacher, Time, Average age of the class.

Uncontrolled Variable. Their previous activities of the student, socio-economic status, self-concept, interest and attitude.

Chapter II

Review of Literature

This chapter deals about the review of related literature and provides the knowledge of what has been established, known or studied and attempted yet. A review of related literature is the source for the further study of the research task. It helps to conduct the new research in a systematic manner by providing the general outline of the study. The review of related literature involves the identification and analysis of documents related to the study. The previous studies cannot be ignored because they provide the foundation of the present study. Some research deals about the theoretical literature, empirical literature, theoretical framework and conceptual framework for the study. In these regard, Khan asserts; the search for related literature is one of the first steps in the research process. It is the valuable guide to defining the problems, recognizing its significance, suggesting promising data gathering device, appropriate study design and source of data (Best and Kahn 2006).

Additionally, the Qualifications and Curriculum Authority (QCA) states that:

A sound grasp of ICT is essential in modern society; it gives pupils the skills and understanding needed to use technology effectively, every day and in the world of work ahead. Moreover, a sound grasp of ICT is fundamental to engagement in modern society; it teaches pupils how to find information appropriate to a task and to judge the accuracy and reliability of what they find. It gets pupils questioning and learning things for themselves and provides a gateway to information and experiences from a wide range of people, communities and cultures (QCA, 1998).

Review of the Empirical Literature

Sapkota (2015) did a research as *"effectiveness of Information communication technology integrated pedagogy at secondary Level".* With the aim to find the

effectiveness of information communication technology integrated pedagogy in the existing educational system among student in the experimental and control group of grade IX. Forty six student of two public schools of Kathmandu district were selected for the study. She conducted studied how ICT brings the effective result in term of achievement of mathematics in comparison to the existing pedagogy as well as student taught by ICTIP are more motivated towards mathematics instruction.

Bhandari (2015) did a research as *" effectiveness of Geogebra assisted instruction in mathematics at secondary level".* With the aim of find the effectiveness of the Geogebra assisted instruction in educational system among student in the experimental and control group of grade IX. 47 Student of two Public school of Kathmandu district ware selected for the study. She conducted class with the dynamic software to share the mathematical content to the student , According to her report shows that student of experimental group ware more achievement level and more motivated than control group in teaching of co-ordinate geometry.

Leong (2013), conducted a study to determined the effects of using the dynamic software, Geometer's Sketchpad (GSP) in the teaching and learning of graph function. This study was conducted among six students in Malaysian secondary school. A quasi-experimental design using intact sampling was employed. A significant different was observed in the achievement of the experimental group as compared to the control. This indicates that the dynamic software (GSP) had a positive effect on student achievement and attitude toward learning graph of function. In this chapter three term are focus: Effectiveness, GeoGebra and teaching geometry. These three aspects are briefly review and captured based on the article, paper and thesis report. GeoGebra is the input variable and it's output had checked on the

achievement of the student in the learning geometry and concluded as the effectiveness of the GeoGebra.

Effectiveness is the toll for high achievement in any field. Effectiveness is the degree to which objectives had achieved and the extent to which targeted is determined without reference to costs and whereas efficiency means "doing the things right" effectiveness means, "doing the right things". UNESCO states that effectiveness is the the output specific review/analysis that measure (the quality of) the achievement of the specific educational goal or the degree to which a higher educational institution can be expected to achieve specific requirement. As the primary measure of success of a programmed or of a higher education institution, clear indication institution, clear indicators, meaningful information and evidence best reflecting instructional effectiveness with respect to student learning and academic achievement, have to be gathered through various procedures (inspection, observation, site visit, etc.). Thus, effectiveness is the high achievement of the student.

GeoGebra was designed by Markus Hohenwarter as an source dynamic mathematics software that incorporates geometry, algebra and calculus into a single, open source, user-friendly package (Hohenwarter,Jarvis,& Lavicza,2008). GeoGebra is a free and user-friendly software that connects geometry and algebra (White, 2012). This software combined features of older software programs such as Maple, Derive, Cabri and Geometer's Sketchpad (Sahaa, Ayub,&Tarmizi,2010). GeoGebra support materials are rather impressive (especially for a free program), Where it provides wide-ranging online help feature, 42-page help manual in pdf format, downloadable tutorials, and a verity of detailed lessons using video-based step-by-step examples. These materials are very concise, easily accessible, and professionally done, with

supplementary suggestion contributed by users. Thus, GeoGebra is the user friendly, easy to apply and dynamic software.

Teaching is the mass activity but learning is individual activity. The project method is a method of discovery and proof in so much as "all thinking result in knowledge, ultimately the value of knowledge subordinate to it's use in thinking"(Deway 1916,p151). Teaching is the global phenomenon, which can intended to the input, as being the teacher need to take care of the understanding, geometry concept and Van Hiele levels. Environment is also important fact to learning information to maintain the environment we need to include more justification, informal proofs and "why" question in math teaching in school level. In general student need to think analyze, reason, and use their brain to solve the problems. The different method can be apply in the teaching geometry to make the concept clear about the geometry. Thus, teaching is the pedagogical process, as a profession and art.

Dogan(2010) conducted an experimental research design using a pre-posttest to evaluate the success of student learning using the GeoGebra software. It was a twelve-hour course held for a period of two weeks involving two eighth grade classes. It was observed that computer based activities can efficiently be used in the learning process and the GeoGebra software encourage higher order thinking skills. In another study, Kemp (2006) found that high ability Grade 9 boys felt the lesson was in retesting. The teacher and student were happy and was able to identify student who faced challenges in such a setting and did not engage in the lesson; therefore it was suggested that further strategies need to be incorporated to motivate most students.

Herceg and Herceg (2010) conducted a study on two groups of students. One group used applet only, the other used the GeoGebra software and applets. The result

of this study showed that the GeoGebra experimental group gained more knowledge and skill than the control. This study also suggested that GeoGebra use is helpful for who face difficult in solving mathematical problems since they do not have to spend so much time solving by hand. Dynamic software improves student's understanding of mathematics, Erhan (2013). Students were able to explore and form conjectures and therefore had better overall scores.

The above literatures show that the effect of technology and effect of software is positive in the mental ability in the learner. The level of understanding also the increase and learner are more motivated in the geometry learning. The theory of constructivist shows that the ZPD of the learner has effect by the software in the learning process. In the way of learning pedagogy, technology based learning is also the one of the method to apply in the classroom. In the context of Nepal P. Bhandari had done the research to find the effectiveness of GeoGebra at secondary school. GeoGebra is effectiveness at basic level to University level. Thus, the effectiveness of the GeoGebra in teaching geometry at grade ten is the locus of the study.

Theoretical Framework

The theory is on the base of the social phenomena. This report may apply the social constructivist theory of learning. The constructivist theory has chosen because it builds on prior knowledge: students use what they know to makes and connection with the help of GeoGebra -assisted instruction. When student make these connections, they learn new technology and relate it to what they already know. In this study GeoGebra, instruction has based on the constructivist theory of learning.

With the regard of Zone of Proximal Development (ZPD), in the learning of geometry, the more skilled student will be able to assist their peers with information and manner of constructing diagram and the more capable student will be able to fill

in the gaps in their peer's knowledge or explanations they have missed. The peers they gain a different insight and develop a different manner of understanding geometry concepts. In addition, when working in groups due to the differing ZPD of each student, they may have differing views; therefore, through interaction with peers they can achieve shared information. The student can develop the critical thinking skill; they can manage their idea and insights learning habits. The student can share their knowledge, which is important to shared views and justifications of opinions to reach manual understanding. This enables all students to participate in critical thinking skill because one's cognitive development becomes apparent when new views and idea had taken into the cognitive state (Leong, 2013).

In conclusion, a constructivist classroom may contain the following four characteristics: cognitive exploration to encourage inquiry and direct hands-on, minds-on activities; student autonomy where students are in charge of their own learning; social interaction where student work together in groups with opportunities for cognitive conflict; and student-centered where student ideas and opinions are important. In this respect, it can also conclude that the teacher's role here is more facilitator. The Geogebra software as the tool to connect the content and learner.

Vygotsky developed a "zone of proximal development" which was the different between what a child is taught by others. He believed that children learn through social interaction and by learning to solve problems with others, he named this process is "scaffolding" (Vygotsky,1978). The study draw up on the constructivist theory of social interaction for cognitive development.

The main principles will anchor on the zone of proximal development (ZPD) and scaffolding. Student generally have challenges in understanding mathematical concepts; therefore, in this study the GeoGebra software was introduce as a scaffold

to enhance student understanding of geometry. The ZPD is describe as the variance between one's mental age and the level one might attains in problems solving with the help of guide. Scaffolding refers to the guidance provided for one to reach the ZPD. In this study, the GeoGebra software acts as the primary scaffold in assisting and guiding the student to reach the ZPD.

The students were required to work in pairs to construct diagrams and make observations based on their construction. Students formed their own interpretations through shared understanding with the guidance of GeoGebra where they were able to explore and visualized on their own. On top of that, the teacher and peers also played the role as the part of scaffolding process. The teacher advocated instructional intervention at the beginning of the lesson to introduce the software tools to enable the student to work in the pairs on their own using the systematic guide without the teacher assistance.

The teacher's role will be more as a facilitator, to encourage students to actively participate in the lesson and make significant connections. This relates to Piaget's work, where he stressed the need to provide formal instructions to assist student to reach a developmental stage where they are able to accommodate and assimilate the student opportunities to guide one another and reach a level of shared understanding. Here the higher ability students play a role in helping the lower ability students to reach their ZPD. The higher ability students also benefit through the new deals and views of their peers. Students also placed in groups of two to work on constructing the diagram.

Vygotsky's theory is very closely related to learning classroom where he force to the social interaction and cultural environment play the vital role in the development of the cognitive level of human being. The mind's primary function is to

Create and see things in a way that organized into schema that helps the mind to see them as being real (Piaget, 1980).

This take place of individual capacity to learn and development the new knowledge. In this study , student were place in groups where the scaffolding process take place for them to learn the geometry based on the pre-knowledge and with the help of GeoGebra and with the peer discussion student can generalized and develop the level of understanding of the mathematical concept. In this process student were take part as the active participant and the role of teacher were just facilitator. Which can help to the student to critical thinking skill as students contribute ideas and view to understand the common knowledge.

Here higher ability student played role in the helping of the lower ability student to reach the goal of higher ability students, which has known as ZPD. The higher levels student also benefited with the supporting to the peers and making a simplicity to his knowledge. The software GeoGebra provides the opportunity to the student for peer discussion and understand and visualization of the geometrical concept.

The above literature show that the effect of technology and effect of software is positive in the mental ability in the learner. The level of understanding also the increase and learner are more motivated in the geometry learning.
The theory of constructivist show that the ZPD of the learner has effect by the software in the learning process. In the way of learning pedagogy, technology based learning is also the one of the method to apply in the classroom. In the context of Nepal P. Bhandari had done the research to find the effectiveness of GeoGebra at secondary school. GeoGebra is effectiveness at basic level to University level. Thus,

the effectiveness of the GeoGebra in teaching geometry at grade ten is the locus of the study.

Conceptual Framework of the Study

This section deals about the conceptual framework for the research. The conceptual framework has established on the basis of, research topic possible areas to fulfill the objectives of theoretical framework for the study. Learning is a process that occurs through social interaction, and students generated new knowledge by building onto what the already know (Bruner, 1973).
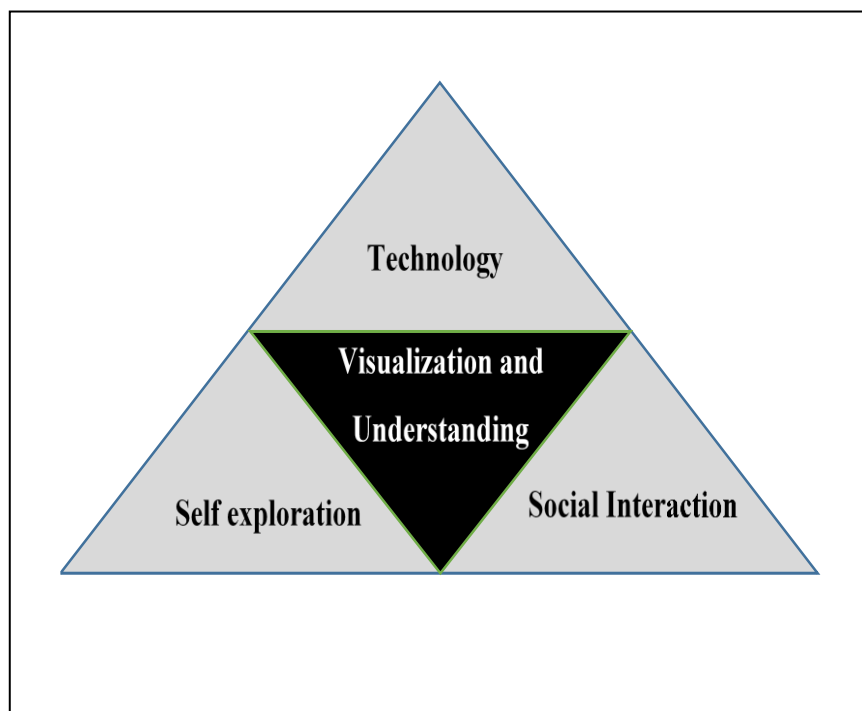
(MOJET, Vol.1, Issue 4)

The frame works, the social constructivism that include social instruction, effect of tool, self-exploration and result get in the achievement of the student. The conceptual framework can be show in figure.

Visualization of the geometry and Understanding is the center of the study. Vygotsky developed a "zone of development", which is the different between what a

child is taught by others. He believed that children learn through social interaction and by learning to solve problems with others, he named this process is "scaffolding" (Vygotsky, 1978). In our activities teacher teach the content with help of the GeoGebra at that time student and teacher interact each other and between the students also they can discuss as the peer group discussion, so, the student can explore the new knowledge with the help of teacher and peer and some knowledge can explore self.

The theory had based on the society. According to the theory, child is the main source of the knowledge. Child can learn the knowledge from the society. The classroom is the mini representation of the society. Environment is also the main tool to learn the knowledge, GeoGebra software can play the vital role to share the knowledge. The main term of the theory are ZPD and scaffolding, the technology and software GeoGebra and the peer discussion can effect on the both term and student can increase the knowledge meter. Thus, the technology based environment and software increase the achievement of the learner.

Constructivism states that human are active learner they construct knowledge for themselves. Piaget also pointed out in his theory, human develop cognitive structure (schemas)from inborn so that they are encourage to learn new knowledge (Vygotsky, 1978). But here, when teacher teach by the method of ICT based, student and teacher together interact dialogue with collaboratively. The student explores knowledge of Geometry by intra-personal as well as interpersonal and become motivated factor in human beings.

Chapter III

Methods and Procedures

This section explains the design of the study in detail. It includes a detail description of the manner in which decision had made about the type of data needed for the study. The tools, device and method used in collection data. Moore (1993) claims that, "The best method indeed the only fully compelling method of establishing causation is to conduct a carefully designed experiment in which the effects of possible lurking variables are controlled. To experiment means to actively change ten and to observe the response in y" (p. 202). The chapter explains design and method of the study, population, sample and sampling strategy of the study and instruments used to collect the data, the statistically procedure used in analysis and interpretation of the results.

Design of the Study

The study is design to examine the effectiveness of Geogebra in the geometry teaching at grade ten. In this study, the researcher used Quasi experimental design to answer the formulated research question. According to Best and Kahn (2006) experimental research describes, what happen when certain variable are carefully controlled and manipulated. The focus was on variable relationships, as define here; deliberate manipulation is always a part of the experimental method. Experimental Design as;

Groups	Pre-test	Treatments	Post-test
Experimental	O_1	GeoGebra assist Teaching	O_2
Control	O_3		O_4

Where,

O_1= Pre-test given to experimental group

O_2= Post-test given to the experimental group

O_3= Pre-test given to the Control group

O_4= Post-test given to the control group

Population, Sample, and Sampling Strategy

Population: The number of student study in Grade Ten in the Khotang district Di.ru

ma.na.pa. are the total population.

Sample: Shree Saraswati Ma. Bi. diktel had selected by the purposive sampling. 36 student are selected for the data collection, among them Sixteen student were selected for experimental group and 20 student were selected for the control group. The student had selected from grade ten of section A and B of the school.

Sampling Strategy: Each group has contained the around the 16 students among them observation has done for the infrastructure of the school and select the group of experimental as well as control group. The different four School has selected for the pre- test and evaluate the mean value. The mean value of the group has 6.25, 8.13, 11.4, 10 respectively. The researcher selected two groups, which has the mean 11.4 and 10. The 10 has selected as the experimental group and 11.4 mean group has selected as the control group. Section A of Shree saraswati ma.bi. diktel as the Control group and section B of the school as the Experimental group. Which has the equal capable group in the pre-test? The given section has notice as group A for experimental group and another control group as the group B. The group "A" had taught with the help of ICT including the Geogebra. Group "B" had taught the expository method for the same content of geometry at grade ten.

They have equally motivation for the classroom activity, if the student are reading out of the class as the tuition, out of average age or other factor that can effects the student achievement that type of students remove or not included in the

generalization the data. There were 24 student were selected for the control group but 4 student were not including in the data analysis due to their age, absent period and children of the mathematics teacher.

Altogether 18 student were selected as the experimental group and reduce the sample due to same problems as age, absent and tuition student at home. Thus, the 16 student had selected as the experimental group. That type as much as heterogeneous.

Selection of the Study Area/Field

The study area of the present study was the effectiveness of the dynamic software GeoGebra in teaching mathematics specially geometry in the Secondary level of the school of Nepal. The study had based on to find the significance different between control and experimental group in the basic level in teaching geometry. The area of the study had selected according to the infrastructure of the school. It has more facility in infrastructure in the school. Diktel is the capital of khotang so diktel had selected as the study area.

Independent Dependent and control Variables

Variables are the condition or characteristics that the experimenter manipulates, control or study. The variables used in the input of the activity have known as the independent variables. The independent variables are the characteristics that the experiment manipulate or control on his or her attempt to accretion their relationship to observed phenomena. The dependent variables are the condition or characteristics that appear, disappear, or change as the experimenter introduces, removes, or changes independent variables (Best and Kahn, 2006). Researcher used as the input for GeoGebra so, the dynamic software GeoGebra is the input or independent variables. Control variables are those variables (i.e. variables not manipulated by the experimenter) that may have a significance influence on the result

of the study. In this study, the effect of dynamic tool Geogebra is the independent variable and the student achievement in geometry and perception about the GeoGebra is the dependent variable in the geometry teaching.

Teaching materials, school characteristics, teacher attitude and characteristics, student in two groups and subject matter of the two groups were not experimental variables. The researcher controls the variable to manipulate the result. In such a way the researcher conduct the teaching episode and control the such type of control variable and conduct the pre-test post-test examination and tabulated the marks and analyzed by the mean, standard deviation and t-value test and provide the result.

Data collection Tools and Instruments

Data collection tool are the instrument to collect the data to fulfill the objective. In this research achievement test and questionnaires are the tool used for data collection.

Achievement test. An achievement test had prepared by the researcher was the main instruments of collections of data for the study which had the type of instruments to be used depending upon the objective of the study. Obviously, in subjective type of instruments researcher had used the achievement test in teaching geometry. The researcher has point out the main topics of geometry of grade Ten; they are Angles, parallel lines, triangles, and circle related problems. These all topics of the unit geometry has instruct at six hours period and had present in the class. From the same content, the achievement test had constructed (Appendix-B).

Construction of the Achievement test. On the basis, that topics four level (Knowledge, skill, comprehension and application) including five different skill (verbal, visual, drawing, logical and application). According to Van Hiele's level of understanding geometrical test items had chosen from the textbooks of grade ten

developed by Nepal Government. An achievement test paper has consist subjective questions from the different level and skill with the total marks 30 item contain   one marks and apply in the pilot test (Appendix A).

Location Hunting for Pilot test. In this present study, researcher conducted a pilot test among 18 student at pancha ma.bi diktel . Who were not included as the sample of the study 20 students had selected as the pilot test, two students were not included due to the eye problems. Since, a pilot test had done before the study. This can help minimize the error of the tool and which can help to conduct the test in the correct way.

Item analysis of the Achievement test. The difficult level and discrimination index of mathematics achievement test had computed to check the quality of the test item. Altogether 18 student had taken to pilot test. Among them upper 27% i.e. 5 student of top scorer and 27% of lower scorer i.e. 5 student had taken in the arranging the copy in the ascending order and score had calculated and analysis. According to the Harper and Harper P-value Interpretation between (0.4-0.75) selected and according to Eble and Frisbie , 1991:232, D-Value Interpretation (0.4-0.8) selected where 8 item were rejected and 22 item were included in the tool, which is constructed and apply in the research(Appendix-C).

Estimation of the reliability of the tool

Researcher conducted as the pilot test and find out the P-value and D-level of the 30 item, where 8 item were rejected and 22 item were included in the tool, which had constructed and apply in the research. In this study, to determine the internal consistency of the achievement test correlation coefficient had tested. To test the correlation coefficient split half method apply and find the reliability of the achievement test. Split half method had apply as the odd even question. After the pilot

test the reliability coefficient test had done where the value of r is 0.97 which show that the the achievement test has more reliable (Appendix-D).

Questionnaires. To find out the perception of student about the GeoGebra set of survey questionnaires had prepare and at the experimental group had tested. To develop the questionnaire online research paper and supervisors advice has taken and Ten different items, has prepared which can help to full-fill the objective has collected and a set of question had developed. In addition, the open-ended question with the student and mathematics teacher and principal done and regular observation tool also apply the in the study.

Selection of the Experimental and Control Groups

One week, regular observation has done to select the group as the experimental and control group. Researcher had chosen two equal level section of the school according to the infrastructure of the school and the technology based classroom in the Diktel. Researcher inform to the student to be ready for the pre- test exam and same day had taken as the pre-test exam. Researcher found the 10 and 11.4 as the mean score of the student and decided to make the lowest mean score achievement group as the experimental and the next group as the control group (Appendix-E).

Selection of the teaching Materials

The main materials of the teaching Episode are textbooks. The textbook had chosen which has developed by Nepal Government. The Geometric part according to the construction of Achievement test different five episode had construct. The other required materials such as question paper and answer sheet researcher himself manage for pre-test and post-test. The main device laptop and software researcher manage and to manage the projector taken support of the school administration. The school

administrations had very positive to support me to collect the data. They provide me the lab to apply the new technology in the teaching geometry.

Construction of the Episodes

Researcher made the different episode to teach in the classroom. Same content in the control group had taught and same content had taught in the experimental Group. Episode had made according the content of grade ten geometry parts such as related problems, experimental verification and construction. Researcher select geometry category of the content to address the content of grade ten which can help the generalized the result for the geometry. The questions had chosen from the book and made the tool, so the episode also made according to the textbook (Appendix-H).

Setting of Experimental and Control Groups

The researcher himself had taught the unit of geometry to both side the experimental and control group. Student had asked the few out question but researcher did not told them out of the episode. The experimental group had taught using the Geogebra in the class and control group had taught through the expository method in the classroom where same content and same time spent in the both groups. The researcher used the textbook developed by the curriculum Development center, Bhaktapur. Researcher used the Nepali and English language in both group. The Researcher had make the friendly environment on both the groups, which can help communicate and share the experiences to each other.

Subject Characteristics

The subject content is the one of the possible treatment to the internal validity in the present study. The characteristics of the subject, which might effects the internal validity, such as student age, language and parents status. The student were taking part as the experimental and control group as same grade level. Their age close

to average but few were not. So, them did not include the analysis of the data in the both group. Therefore, these characteristics did not influence the result.

Experimental Mortality

Experimental mortality means the loss of subject during the period of the experimentation. In the research some student were loss the experiment due to bus Left and some due to their family problems, thus such type of student were not included as the calculation of the data. Altogether 18 student and 16 student were experimental and control group among them 22 and 20 student only used to calculate the result.

Statistical Regression

An effect of the result of tendency for subjects selected expertise score to regress toward the mean on subsequent task has called statistical regression (Best and Kahn, 2009). In this study, the naturally intact group had taken as the experimental and control group. Group had not form by researcher, group of the student had selected as the formed in the nature, which had not effects data collection and analysis.

Selection Bias

Selections bias which is likely to effect the internal validity result when the researcher makes a comparison between the experimental and control groups. It is another treat to the experiment. To maintain the Bias of the group researcher did each activity very sensitively and act seriously. Naturally, intact group had taken and low achievement group select as the experimental group and the high achievement group as the control group. So, in this research has not any selection bias to select the experimental and control group.

History

Events outside the experiment or between the repeated measured of the dependent variable may effect participant response to experimental procedure. Natural disaster, political change, social phenomena take place to change the score of the student achievement in the pre-test and post-test. Therefore, in this study one weak period had taken to make the result free from the historical effect of the study. Interaction Effect of the Testing

The period of experimental was short. So, the researcher use the pre-test before the vacation on the both group. The experimental activity has done after the vacation and the post-test also done after the teaching activities and also the questionnaires and interview tool also used after the end of post-test.

Control Teaching Strategies

Teaching is another treat for the experimental process. Researcher taught in the both group by himself. Same content by looking the episode and not out of the content. Few student were asked out of episode but researcher did not explain that problems in the class. Researcher told them to learn after the experimental section. Researcher used same time interval in both group and same way apply for motivation in the learning of classroom.

Data Collection Procedure

Student had allowed sit in the different place day to day in the classroom. During the post-test period researcher announced the schedule two day ahead in the both group and examination had held in the similar in the size same time intervals. After the exam, answer sheet had collected and scored by the researcher and then the scores had tabulated for the analysis.

The same time and same question had apply in the pre- test and same method apply in the post-test. Post-test had taken after the 42 days while pre-test had taken. Thus, the same tool apply for the post-test. A set of questionnaire also had distributed at the end of the post-test exam collected, tabulated and generalized. To generalize the effect of GeoGebra some open questions had asked to some students in the class during teaching by the researcher by selecting the studernts randomly. Question related to GeoGebra based asked to principal and subject teacher and noted in the diary.

Data Analysis Procedure

To complete the objective of this study mathematics achievement test and set of questionnaires had used to obtain student's achievement score and to find out the perception about the Geogebra. Mean, standard devastation and t-value for both groups with their secured marks had calculated. The researcher had used mean to generalized the data analysis on both group. In the both group the high mean score show the achievement of the student. In addition, two-tail t-test at 0.05 level of significance in the 55 degree of freedom to find whether the difference of mean in statistically significant or not by using the method pooled variance formula. Where the tabulated t-test value is 1.96, which, had compared with calculated value and analyzed.

A set of survey questionnaires had construct to find the attitude of the student about the GeoGebra. Where yes-no question had included, according to the percent of the attitude of the student in the side of yes or no, we can generalize. Open-ended questionnaires had asked to the teacher and student to find out the status of the student and to make appropriate environment in the school. Discussion with the friends, teachers and had done to generalization the data. Advice of the teacher has taken to generalization of the row data.

Chapter IV

Analysis and Interpretation of Data

The most important part of the study is to analyze the collected data. The collected data in the form of large amount information has reduced into simplified form. This study entitled "Effectiveness of GeoGebra in teaching geometry in grade ten (x)" was an experimental research involving pretest-posttest research design. The main aims of this study was to compare the achievement score of students taught by GeoGebra assist learning and expository learning method of teaching geometry (Angle, circle and Tangent) in this experimental research. This study intended to explore the effectiveness of GeoGebra learning method in teaching geometry at grade ten student.

This chapter deals with the statistical analysis and interpretation of data from the achievement score of the sample student. These data has tabulated and analyzed through mean, standard deviation and analyzed data and perception will analyzed with the help of percentage. The research has analyzed under the following heading: Comparison of the achievement score of students in the GeoGebra assist learning and expository learning group in pretest.

Comparison of the achievement score of students in the GeoGebra assist learning and traditional learning group in posttest.

Explore the perception of the student about the GeoGebra in teaching geometry. Researcher collected the achievement score and organized, tabulated and subjected to statistical test and interpreted. The marks obtained by the student has tabulated in (Appendix, G,H).

Comparison of the Achievement Score of Student in the Pretest

This study was to compare the achievement between two groups. The posttest a score of student of GeoGebra assist learning groups and traditional learning groups with work involved in the computation of mean and standard deviation of the marks obtained by formula and show in the mean, standard deviation and calculated t-value on the pretest result in the following table.

Table 1: Mean and Standard Deviation of Score in the pre-test.

Group Size	Sample	Mean	S.D	Calculated t-value	Decision
Experimental	16	10	2.829		Null hypothesis accepted
Control	20	11.4	3.38	-0.745	

Two tail test, $t_{0.025}$, 34=1.960 at 0.05 level of significant

Table 4.1 presents the mean and standard deviation of both GeoGebra assist learning and traditional learning groups on pretest. The mean score of GeoGebra assist learning groups was 10 out of 16 with the standard deviation of 2.829 and that of traditional learning group was 11.4 out of 20 with the standard deviation of 3.38. The calculated value of t i.e. -0.745 was less than the tabulated value of t i.e. 1.960. This indicate that the different between these two groups was not significant at 0.05 level of significance in the 55 degree of freedom. Therefore, the GeoGebra assist learning group and traditional learning groups were at the same level of achievement at the start of the study.

Comparison of the Achievement Score of Student in Posttest.

The achievement score of the students GeoGebra assist learning groups has computed by formula and has shown in the mean standard deviation and calculated t-

value on the posttest result of GeoGebra assist and traditional learning groups in the following table.

Table 2: Mean and Standard Deviation of score in Posttest.

Group Size	Sample	Mean	S.D.	Calculated t-value	Decision
Experimental	16	18.125	3.807		Null Hypothesis
Control	20	12.6	3.549	2.36	rejected

Two tail test, $t_{0.05}$, 34=1.960 at 0.05 level of significant

Since the Table 4.2 shows that the post-test achievement means the GeoGebra assist learning groups and traditional learning groups. The result indicated that the mean score of GeoGebra assist learning group has mean 18.13 out of 16 and that of traditional learning group has mean 12.6 out of 20. The calculated t-value is 2.36 had greater than the tabulated t-value 1.960 at 0.025 level of significance with the degree of freedom 34 in two tail test. Thus the null hypothesis on the achievement of the student was rejected i.e. alternative hypothesis on the achievement of the student was accepted. Thus, the different of the mean had found significant at 0.05 level of two-tail test. This shows that the achievement of the student in the GeoGebra learning group had benefited in the compression to achievement of the student in traditional learning group in teaching geometry. It means that GeoGebra assist learning method is better than the traditional learning method in teaching geometry at grade Ten students.

The achievement of the experimental group had better than control group. The social constructivist theory also explain the ZPD increase the level of achievement is applicable in the research. The theory is giving the way to make the bund. GeoGebra is the dynamic tool play the role of ZPD and the peer discussion is playing the social

interaction in the experimental group. Student had exploring the self and increasing their achievement due to their peer discussion and with the help of GeoGebra. Thus, GeoGebra is effective tool to apply in the geometry teaching.

Students perception about the GeoGebra

The perception of students towards learning geometry through GeoGebra software was identified through questionnaires of experimental group. The questionnaires consist of ten items.

Table 3: Student perception about the GeoGebra has tabulated here

S.N.	Including question to take the perception of the student.	Yes	No
1.	I was excited while using GeoGebra in learning Circle.	16 100%	
2.	I learnt a lot of geometry concept using GeoGebra software.	16 100%	
3.	I felt confident to solve the problems using the GeoGebra.	16 100%	
4.	I was very engaged in the learning process at the classroom .While discussing circle	12 60%	4 40%
5.	I benefited a lot through the teacher-students interaction in the classroom.	16 100%	
6.	I was able to visualize and answer the questions after each activity.	14 87.5%	2 12.5%
7.	I was able to think positively for the geometry concept of circle.	15 93.75%	1 6.25%
8.	I was able to solve the problems critically.	12 75%	4 25%
9.	I enjoyed learning mathematics much more using GeoGebra.	16 100%	
10.	I was able to find the better connections between previous learning and new learning.	15 93.75%	1 6.25%

Result from Table 4.3 show that student generally provide positive feedback toward the GeoGebra software. The majority of student, about 100% of them mentioned that they learnt a lot using GeoGebra and benefited much through the teacher-students interactions when using GeoGebra software. 100% of the student mentioned that they were excited about using GeoGebra software, engaged in the learning process, and were able to visualize concepts related to geometry and answer the question after each activity. About 75% of students said that they were able to think creatively and critically in the discussions and during the question and answer session, were able to make logical assumption when attempting to hypothesize. The student provide their perception on the topic of benefited peer discussion and teacher discussion in the learning process. Teacher also the interested about the GeoGebra to apply in the learning classroom.

They also enjoyed learning mathematics much more when using GeoGebra and were able to form better connections between previous learning and new learning. However, some students reported they were not- better connection between the previous and new learning, and 25% student give the perception about the negative in the topic of solving the problems in critically when using the GeoGebra software. Some student give the perception on negative side to solve the problems in the classroom due to not getting time to solve the problems in the every time in the classroom. 25% of the student provide the negative attitude in the topic of to solve the problems critically.

According to the above discussions student provide the perception about the GeoGebra as the positive side. The mind's primary function is to creat and see things in a way that can be organized into schema that helps the mind to see them as being real(Piaget, 1980).In the policy provision of the Nepal and the curriculum

development center also provide the space to apply technology in the classroom. Thus, we can apply the GeoGebra in the teaching and learning in the mathematics classroom.

Finding and Discussion of the Interview

The main objective of the research had find the effectiveness of the GeoGebra in teaching geometry at grade Ten. To fulfill the given objective perception about the geometry had the one of the supportive objective to connect the gaps. At the first day of the field trip researcher visit to the one school and talked with the principal about the research work. He was very excited, and told me *"I will try to manage."* but unfortunately the device does not work properly. He informed me *"sir, you can visit us after one weak I will manage that problems and back up problems also will be manage"* which shows that the administration had positive attitude to apply the technology in the learning pedagogy.

The researcher had come from the TU, want to discuss about geometry with the help of the technology. "Sure why not?" She helped and inform to the coordinator to manage the class and coordinated with the mathematics teacher and inform the mathematics teacher in the class because it is useful to you. Which is also the positive attitude about the technology (GeoGebra). Mathematics teacher told, *"Where do you learn that type of software which is very fruitful to explanation of geometry?"* Which sound the positive about the GeoGebra. After two day, work she suggest me that one-day motivation class must provide class 9 and 10, which inspire me that the GeoGebra has taken positive attitude by teacher and administrate people.

Discussion, solving problems, can conclude that they learn the concept of geometry in different way and visualized the concept in general way and able to solve the problems. *"I can understand the mathematics in the same way only"*, *"Sir in our*

previous school, there was not that type of technology, if I was not here I won't learn geometry, it was very difficult for me but I can solve geometry in easy way." That is the confident level of the student, which is playing the vital role in the perception of the student in positive way to apply in the teaching geometry.

In the experimental classroom activities. Student were taking actively participant in the learning process. Which show that the student were understand the given content. They were asking the question to the friend and researcher also. They were sincerely solved the problems and make the new concept. School is the mini society, student discussion is the peer discussion had the based on theory. Theory had proven and according our discussion, we can conclude GeoGebra is effective in teaching geometry.

Chapter V

Summary, Finding, Conclusion, and Implication

This chapter has provide the information about the summery and key finding of the research, its implication and conclusion. The brief information is maintain here:

Summary

This study was concerned the study on the effectiveness of GeoGebra on teaching geometry at the grade ten. This study was intended to find the answer of the question whether the use of GeoGebra affect the achievement of student in teaching geometry at Secondary level of not.

For this purpose, the researcher developed and established the item test analysis and reliability of the achievement test and for to understand the perception of the student about the GeoGebra make a question set with the help of the previous research module and modify in term of the geometry and apply in the respective area. Both the test content the same questions from the geometry set on the basis, teaching episode.

A Pre Test- Post Test nonequivalent group design has adopted for the purpose of the study. Grade ten student of BLESS and SDA had chosen for sampling purpose. Two non-equivalent groups had established on the basis, the student participation in the class of the grade ten at both distinct school at Diktel khotang. The researcher himself taught the selected content unit to both the control and experimental group. The instructional period was six different episode only. A posttest had administered to the both group. The data had obtained and had analyzed using the t-test statistics. Experimental group was less achievement in the pre-test but their post-test achievement mean is better than control groups.

Hence, it had concluded that the teaching geometry by using GeoGebra assist learning caused better achievement then without GeoGebra assist learning. The perception of the student about the GeoGebra is also the positive, where around ten different question were included among them most of the student give the positive attitude in the yes- no scale of the questionnaires. This shows that student have positively motivated on GeoGebra-assist learning in term of enthusiasm, confidence and motivation. This new method of learning and teaching had introduced to Mathematics educators so that student can explore the world of Mathematics in a wider and make the student able to think critically and creatively.

Findings

From the result of the Experimental study, the researcher had the finding. Researcher selects the two non-equivalent group as the experimental and control group. After the 1 weak study the researcher apply the GeoGebra in the experimental group as the independent variable and test the result as the output or dependent variable as the achievement of the student. Make the strong data the researcher apply the Questionnaire and Interview tool to find the data. According to the all tool the researcher found,

- 1.4 mean different between the two groups after apply of the GeoGebra.

- The mean of the experimental group was 10, which had increase and tend to 18.125

- The control group was 11.4 at the pre-test and increase at the post-test as 12.6 is limited increment in the compare of the experimental group.

- The finding of the research had the significant different between the experimental and control group.

- The t-test shows that the calculated value of t is -0.745 in the pre-test, which is not significant result but in the post-test.

- The calculated value had 2.36 where the tabulated value is 1.96 which value is less than the calculated value.

- The t-value report shows that the 0.025 level of significance in the 34 degree of freedom is different.

- Which show that the null hypothesis rejected and the alternative hypothesis accepted.

- Above information concluded that the effectiveness of GeoGebra in teaching geometry take positive sounds.

- The attitude of the student about the GeoGebra specially, in the field of excited, learning process, confidence level, benefited through interaction, enjoying while learning provide by student 100% positive result.

- The remaining topics provide more than 50% positive result. Therefore, the student attitude about the GeoGebra had positive.

- Mathematics teacher and Principal also provide the positive sound about the GeoGebra.

- Thus, the next finding of the research work has the positive attitude about the GeoGebra.

Reflection

It has been found that had taught through use of GeoGebra assist learning is effective than without GeoGebra assist learning in teaching geometry at basic level. Use of technology in the classroom is more motivated to the mathematics learning. Use of Geogebra in the classroom is effective tool than traditional method. Teacher and other respective person had motivated to apply the technology in the learning

environment. Student prefer to use Computer assist method to learn the geometry when they utilized GeoGebra to geometry tasks. The Computer method is completely new for student; they has exposed to the traditional method. Therefore, sometime it was difficulties to cope with the new setting.

The various feature of the GeoGebra like visually, dynamic help to the student to understand the concept in the depth. The immediate feedback is playing the very vital role in learning and student were very positive to learn of the geometry. GeoGebra is the one of the tool, which assist to the student in simple way and different way, which can provide the immediate feedback so it is advantages to traditional learning method. GeoGebra can be useful mathematical tool that can integrated for teaching of mathematics at basic level.

Conclusion

In this study, the GeoGebra software has proven to be an effective tool in enhancing Mathematics teacher and learner, especially in learning geometry in the secondary level. Student were motivated and taking positive attitude to learn the geometry through the GeoGebra. It is better to learn self and peer discussion rather than passive learners. The GeoGebra play the role of ZPD of the student and the level of the understanding of the student also increasing. So, the police level need force to apply the technology in the classroom. Training should provide to Mathematics teacher and encourage them to apply in the technology and apply the GeoGebra software while teaching geometry. Regular supervision should be in the classroom.

Recommendation

The following topics has recommended as the further research:

➢ To test the Effectiveness of GeoGebra in the Kindergarten to University level in teaching mathematics.

➢ To find the effectiveness of GeoGebra in the Ruler area of the Nepal.

➢ To find the access of the technology in the context of Nepal in teaching field.

➢ To find the advantage and disadvantage of software in the teaching geometry.

➢ To find the access of the technology in the classroom of Nepal.

➢ To compare the achievement of the student between two groups.

Implication

According to the finding of the data of the present study in different sector we can apply the GeoGebra software in the teaching and learning geometry in the academic curriculum. The GeoGebra software can be apply the Kindergarten to University level & to the researchers for future investigation on this topic has presented in the following sections.

Implication for the Police Level

The police is the main roadmap of curriculum design, which had effected by the politics, need of the society, international curriculum. Ministry of education and NCED should encourage to the teacher to apply the technology, which is in the policy but it is not in the sufficient practice. Teacher must get regular training about the new software and regular supervision must be in the classroom. Feedback and motivation for the active teacher and reward and punishment tool need to apply in the teacher evaluation. The result of this study suggest that police maker can more actively encourage the use of GeoGebra software in the teaching geometry in the class.

Implication for Practice Level

GeoGebra-assist learning is the student center method in the learning process. Student can take part in actively in the learning process. So, at the school level we can use GeoGebra software while teaching. The present study has established that Geogebra-assisted instruction significantly improves the performance and learning

achievement of the mathematics. The teacher can apply the GeoGebra as the bridge to connect the content and brain of the child. GeoGebra-assist learning can be arrange to present in large classrooms as it provides maximum amount of verity and flexibility by maintaining the quality as well quantity.

Implication for Further Level

This study had conducted with small sample size. Larger sample size for the further studies in implicated to increase the validity of the study. The study had conducted in the grade eight. The further study can be conduct in the other lower class and upper class in the school level to make the standard of the thesis topics. Experimental verification of the content which student can solve by themselves in the lab is the area of the study.

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Appendix A

Test item in the different level

Subject:- Compulsory Mathematics   Unit:- Geometry

Topic:- circle   Class :- Ten

Level/Skill	0	1	2	3	4	Total	Remarks
Visual	1	2	1	1		5	
Verbal	0	1	1			2	
Drawing			1	1		2	
Logical	1	1	1	1		4	
Application	1	1	1			3	
Total Item	3	5	5	3		16	
Marks obtained	One marks each 8x1=8		Two marks each 5x2=10	Four marks each 3x4=12		30	

Appendix B

Pre-Test 2074

Sub:- Compulsory Mathematics   Full Mark:- 30

Class:- 10   Pass Mark: 10

Time:- 24

Attempt all the question:-

1. Find the value of given unknown angle.
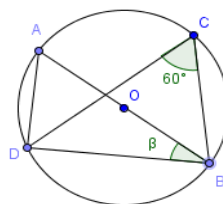
2. Find the value of given unknown angle.
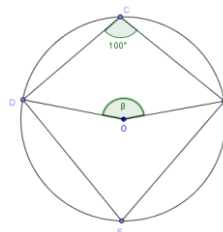
3. Find the value of x.
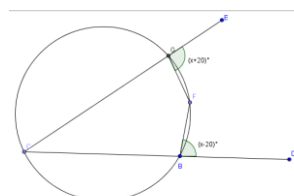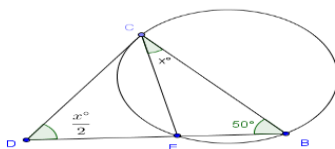
4. Find the value of x.

5. Find the value of x.
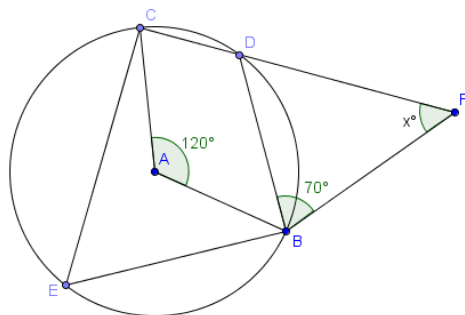
6. In the semicircle PQR of a centre O.PR= 6cm , QR=8cm find the length of OR?
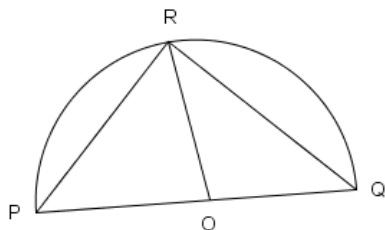
7. In the given figure 'O' is the centre of the circle, AD∫BC

Group "B"

8. Prove that the parallelogram standing on the same base and same parallel line are equal in area.

9. Prove that the angles at the circumference of the circle standing on the same arc are equal.

10. Prove that the opposite angles of a quadrilateral are supplementary

_____The End _____

APPENDIX-C

Item Test Analysis

St	Upper 27%						Lower 27%										
Q N	A	B	C	D	E	Total	A	B	C	D	E	Total	D	Remark	P	Remark	
1	1	1	1	1	1	5	0	1	0	1	1	3	0.4	Very Good	40	General	
	1	1	1	1	1	5	0	1	0	1	0	2	0.6	Very Good	60	General	Accepted
2	1	1	1	1	0	4	1	1	0	0	0	2	0.4	Very Good	40	General	
	1	1	1	1	0	4	0	0	0	0	0	0	0.8	Very Good	80	General	Accepted
3	0	0	1	0	0	1	0	0	0	0	0	0	0.2	Good	20	very difficult	
	0	0	0	0	0	0	0	0	0	0	0	0	0	Negligable	0	very difficult	Rejected
4	0	0	0	0	1	1	0	0	0	0	0	0	0.2	Good	20	very difficult	
	0	0	0	0	0	0	0	0	0	0	0	0	0	Negligable	0	very difficult	Rejected
5	1	1	1	0	0	3	0	0	0	0	0	0	0.6	Very Good	60	General	
	1	0	0	0	0	1	0	0	0	0	0	0	0.2	Good	20	very difficult	Accepted
6	1	1	0	0	0	2	0	0	0	0	0	0	0.4	Very Good	40	General	
	1	1	0	0	0	2	0	0	0	0	0	0	0.4	Very Good	40	General	Accepted
7	1	1	1	1	1	5	1	0	0	0	0	1	0.8	Very Good	80	General	
	1	1	1	1	1	5	1	0	0	0	0	1	0.8	Very Good	80	General	Accepted
8	1	1	1	1	1	5	1	1	1	0	0	3	0.4	Very Good	40	General	
	1	1	1	1	1	5	1	1	1	0	0	3	0.4	Very Good	40	General	
	1	1	1	1	1	5	1	1	1	0	0	3	0.4	Very Good	40	General	
	1	1	1	1	1	5	0	1	0	0	0	1	0.8	Very Good	80	General	Accepted
9	1	1	1	1	1	5	1	0	0	0	0	1	0.8	Very Good	80	General	
	1	1	1	1	1	5	1	0	0	0	0	1	0.8	Very Good	80	General	
	1	1	1	1	1	5	1	0	0	0	0	1	0.8	Very Good	80	General	
	1	1	1	1	1	5	1	0	0	0	0	1	0.8	Very Good	80	General	Accepted
10	1	1	1	1	1	5	1	1	1	0	0	3	0.4	Very Good	40	General	
	1	1	1	1	1	5	1	1	1	0	0	3	0.4	Very Good	40	General	
	1	1	1	1	1	5	1	1	1	0	0	3	0.4	Very Good	40	General	
	1	1	1	1	1	5	1	0	0	0	0	1	0.8	Very Good	80	General	Accepted
11	0	1	1	0	0	2	0	0	0	0	0	0	0.4	Very Good	40	General	
	0	0	0	0	0	0	0	0	0	0	0	0	0	Negligable	0	very difficult	
	0	0	0	0	0	0	0	0	0	0	0	0	0	Negligable	0	very difficult	
	0	0	0	0	0	0	0	0	0	0	0	0	0	Negligable	0	very difficult	Rejected
	22	22	21	18	17		14	10	6	2	1						

APPENDIX-D

Reliability coefficient test of the test.

S.N.	Score of odd item X	Score of even Y	X^2	Y^2	XY
1	10	12	100	144	120
2	10	12	100	144	120
3	10	11	100	121	110
4	8	10	64	100	80
5	8	9	64	81	72
6	6	8	36	64	48
7	1	9	1	81	9
8	2	4	4	16	8
9	1	1	1	1	1
10	1	0	1	0	0
	57	76	471	752	568
			38.22303	41.76123	1348
		r(x,y)	0.844484		
		R	0.915686		

APPENDIX-E

Marks obtained by the student in the pre-test.

S.N	Control Group	Experimental Group
1	13	11
2	14	13
3	13	8
4	12	9
5	10	7
6	8	11
7	9	12
8	11	9
9	12	12
10	12	11
11	13	10
12	9	11
13	8	12
14	9	9
15	10	7
16	11	8
17	13	
18	12	
19	15	
20	14	
Sum	228	160
Mean	11.4	10

APPENDIX-F
Marks obtained by the student in the post-test.

S.N	Control Group	Experimental Group
1	16	21
2	13	22
3	15	20
4	14	19
5	15	10
6	16	17
7	14	16
8	20	14
9	14	18
10	10	19
11	9	20
12	11	16
13	8	21
14	4	15
15	19	22
16	13	20
17	17	
18	10	
19	5	
20	9	
Sum	252	290
Mean	12.6	18.125
S.D	3.54964787	3.807886553

APPENDIX- G

Teaching Module

This module has designed to help prospective researcher in teaching geometry of grade Ten students. By the help of this module teacher can teach or encourage the student activities and student know about ICT Using by Teaching Geometry. The content of the module has completely based on the grade Ten mathematics curriculum. It was helpful not only for researcher but also equally useful for pupils. It is intended guide prospective researcher in teaching the concept of geometrical ideas meaningfully, in selecting appropriate teaching strategies and using GeoGebra assist learning method effectively.

Instructional Objectives

At the end of teaching learning activities student had able to:

- To define the Center, Radius and line segment.

- To define the angle , Chord and parallel lines.

- To introduce the Semi-circle and Circle.

- To define the Circumference , diameter and secant.

- To determine the value of the angle related problems of circle.

- To apply the concept of angle to solve the problems.

- To construct experimental Verification of different theorem.

- Apply the basic concept of theorem and solve the problems.

- To verify the experimental way of the Centre angle and circumference angle of circle and Opposite angle of Cyclic quadrilateral of circle.

Detail contents

The researcher points out the main topics of the unit geometry to Review of circle, its parts and properties of grade ten . There were : Angles problem, Theorem of circle, Triangle, Experimental verification and related exercise.

Teaching Materials

Laptop, Projector, GeoGebra Software, Camera, etc.

Teaching Method

Teacher had used GeoGebra assist teaching learning approach in the classroom. The student had focused to take the part in learning activities according to the given instruction and take part to discussion in the display figure and content. Teacher present the task through the technology and had developed the dynamic figures which, can make the concept in simple form and make the easy to learn.

Evaluation

Classwork and Home assignment had given daily. At the end of this unit, achivement test had taken from the student. In each regular evaluation had administered and the teacher had observed all the activities of the student.

Teaching Episodes One

 I interred in the class with smiley face and firstly I introduced myself to the all the student of grade Ten. I inform the student about our time and objectives of the class activities of the class activity. Student are suppose sit in the classroom randomly and are not suppose make unhealthy classroom environment. In the our classroom we are going to talk about the learning of geometry content through the GeoGebra software. So, if you have any question about the content and problems you are suppose, ask the question. Teacher had motivated to the student to take part in the learning activities. First day, talk about the very basic concept about the geometry.

We was talk about the centre , line, angle ,Chord ,Segment, Secant , Radius , and Sector.
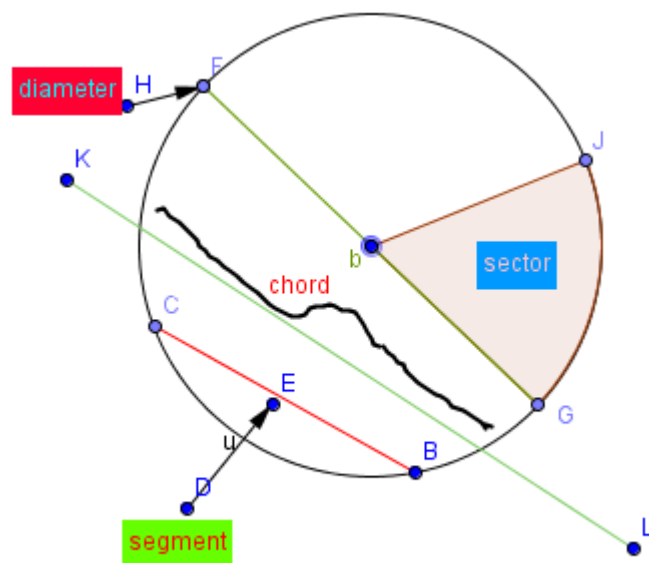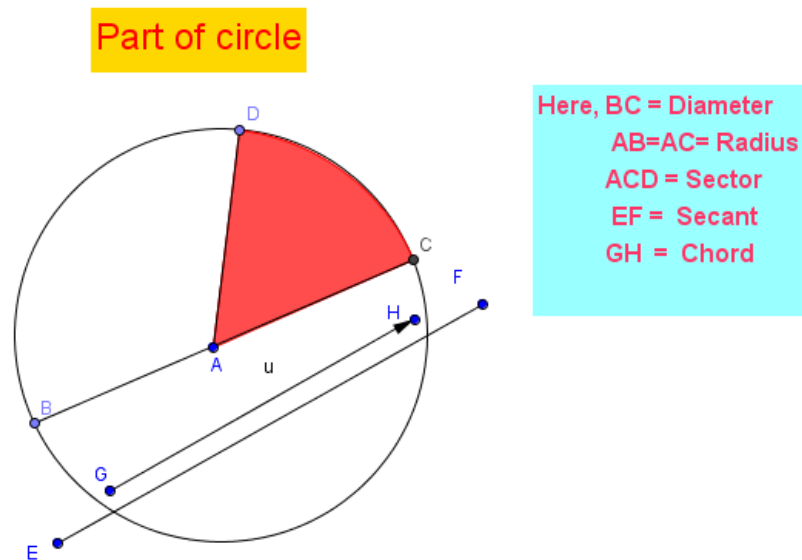
➢ A circle is closed figure consisting of infinitely many points such that each points is at a constant distance from a fixed point.

➢ The fixed point is called the Centre and the constant distance is called the radius of the circle.

➢ The perimeter of the circle is called its circumference. In the figure, b is the Centre and bJ, bF or bG is the radius.

➢ The line segment joining any two points on a circle is called a chord of the circle.

➢ A diameter of a circle is a chord of the circle passing through its Centre. Any diameter of a circle is twice its radius. Diameter is the greatest chord of a circle. In the figure, FG is a diameter and BC is a chord.

➢ If a chord is extended infinitely in both the directions, then the line, thus formed, is called a secant of the circle, in the figure, KL is a secant.

➢ A chord is a part of a secant.

Some problem of theorem discussed in the classroom

The angle at the centre of a circle is double then that of an angle at the circumference standing on the same arc.
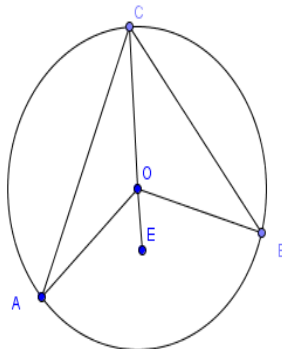
Theoretical proof
Given 1 ; o is the centre of circle
2 ; ∡AOB at the centre and ∡ACB at the circumference standing on the same arc AB
To prove ; ∡AOB = 2∡ACB or ∡ACB = 1/2∡AOB
Plan ; Join CO and product it to X

Statement	Reason
1 AO = OC	Radii of the same circle
2) ∡OAC = ∡OCA	Base angle
3) ∡OAC + ∡OCA = ∡AOE	Exterior angle is equal to the sum of two opposite angle
4)Same, 2∡OCB = ∡BOE	Same as above
5) 2(∡OCA + ∡OCB)= ∡OAE + ∡BOE	Adding 4 and 5
6) 2∡ACB = ∡AOB	Whole part axiom

Next, problems also discuss in the classroom as the event of the

Second episode

The angle at a centre of a circle is double then that of an angle at a circumference standing on the same arc.
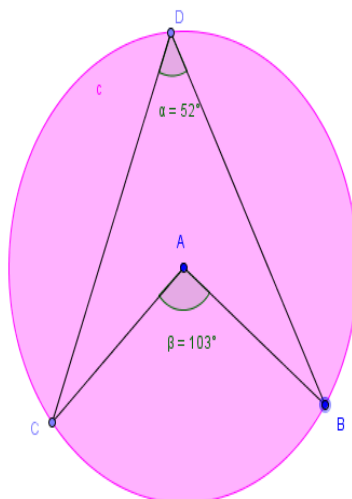
Conclusion
1] 2∠BDC = ∠BAC   That is 2×52° =103°
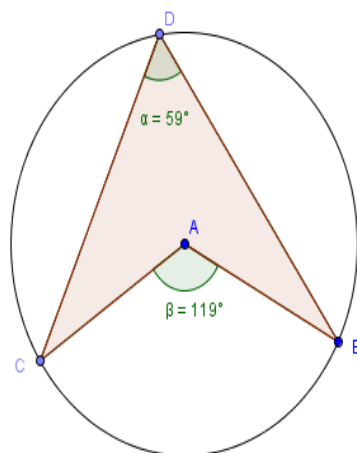
D
α = 52°
c
A
β = 103°
C
B

Similarly,

D
α = 59°
A
β = 119°
C
B

The angle at the centre of the circle is double then that of an angle at the circumference standing on the same arc.
2∡CDB = ∡CAB
That is
2×59° = 119°

With The sufficient discussion and solution of the problem class had closed

First theorem has complete and next discussion is application of these theorem
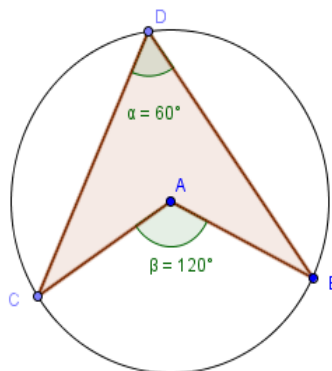
The angle at the centre of the circle is double then that of an angle at the circumference standing on the same arc.

2∢CDB = ∢CAB

That is

2×60° = 120°

From the given figure ,find the value of x°
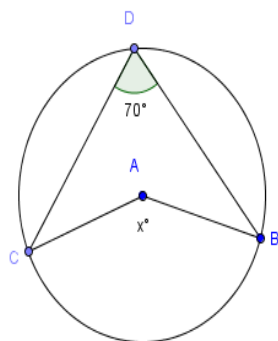
Solution,
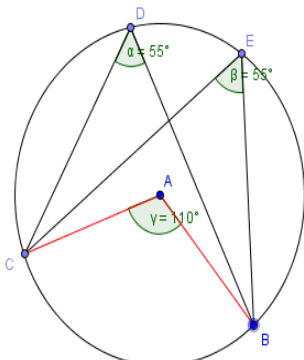
2 ∢CDB = ∢CAB [Being Central angle and
x   =70*2   inscribed angle]
x   = 140° Ans

Third Episode

At the beginning of the class students attendance will be taken and motivation

will be provided to the students ,Now be ready for the third events . today we

are going to discuss about Second Theorem of circle. Angle in the same

segment of a circle are equal.

Next, problems also discuss in the classroom as the third event of the episode

Angle in the same segment of a circle are equal

Conclusion

1] ∠CDB = ∠CEB

2] ∠DCE = ∠BEC

That is α = β

Here   59° = 59°

From the given figure, find the value of x°
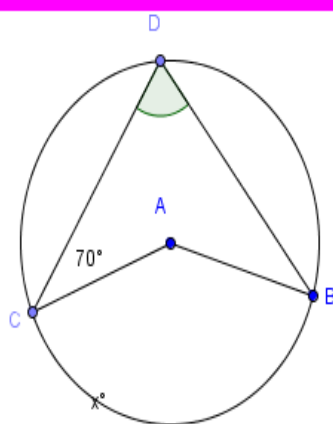
Solution,

2 ∡CDB = ∡CAB [Being Central angle and

x   = 70*2   inscribed angle]

x   = 140° Ans

Find the value of X°
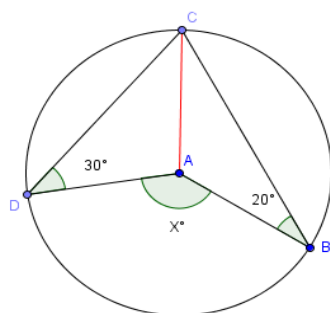
Solution

join A and C of given figure

∡CDA = ∡DCA   [Being AD=AC]

∡DCA = 30°

∡ABC = ∡BCA [Being AB =AC]

∡BCA = 20°

Again,   ∡DCB = ∡DCA + ∡ACD

20° +30°

= 50°

so,   2∡DCB = ∡DAB [Being central angle and

∡BAD = 2*50   inscribbed angle]

100 Ans

Find the value of x°
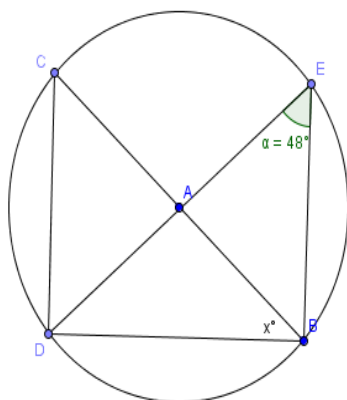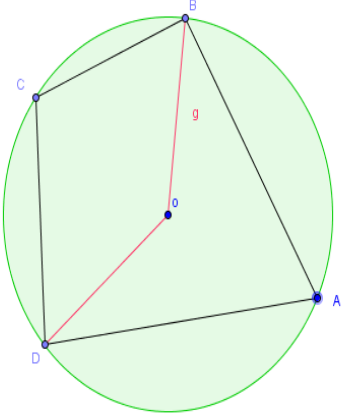
Slution:-

1. ∡CDB=90°   (angle inscribe in semi-circle)

2. ∡DEB=∡DCB   (being angle inscribe in the same arc.)

3. ∡DCB+∡CDB+CBD=180° (being interior angle of triangle)

....

x°=42° Ans

Episode Four

All the Student are welcome in the fourth day of the section. Today , we are going to discuss about the cyclic quadrilateral . Firstly we discuss about Quadrilateral by using GeoGebra softwere. In the classroom , we are talked about opposite side of cyclic quadrilateral

The opposite angle of a cyclic quadrilateral are supplementary.
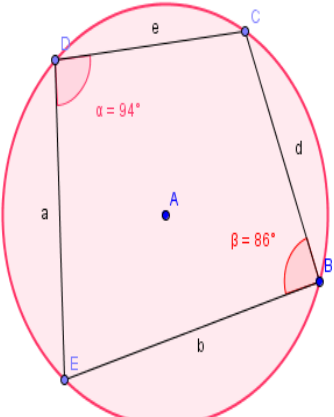
Theoretical proof
 Given: 0 is the centre of circle
        ABCD is a cyclic quardrilateral
To prove: 1) ∡ADC + ∡ABC = 180°
          2) ∡BCD + ∡BAD =180°
Plan : Join OD and OB
Statement   Reason
1) ∡BAD =1/2 ∡BOD(Obtuse)   → Being central angle and inscribed angle
2) ∡DCB =1/2 ∡DOB(Reflex)   → Same as the above
3) ∡DAB + ∡DCB = 1/2(∡DOB Obt + ∡DOB Ref)→adding 1 and 2
4) ∡DAB + ∡DCB = 1/2*360   → Angle made one rotation
5) ∡DAB + ∡DCB =180   →From 4
6) ∡ADC + ∡ABC =180   → Same as above
                    proved

Next , we discuss about application of this theorem

The opposite angle of a cyclic quadriateral are supplementary

Conclusion:
1] ∠CDE + ∠CBE =180
2]∠BCD + ∠BED = 180
That is α +β =180

94° +86° =180

In the given figure ABCD is a cyclic quadrilateral if ABCD is a parallelogram find the value of $\angle$BAD.
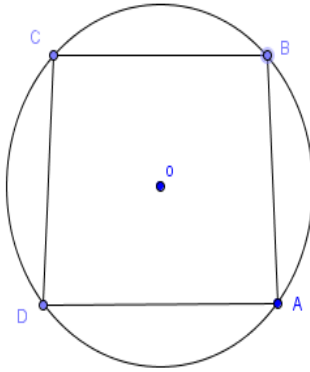
Solution

$\angle$BAD = $\angle$BCD [Opp. angle of parm.ABCD]

$\angle$ BAD + $\angle$BCD =180°[Opp. side of cyclic quardilateral are 180]

$\angle$ BAD + $\angle$BAD =180°

or,   2$\angle$BAD = 180°

or, $\angle$BAD = 90° Ans

Finally, the last event of the forth episode class is the Opposite side of quadrilateral

are 180

Fifth Episode

You are welcome in your fifth day of section. Today we are going to discuss about out theorem of circle . and tangent of the circle There are different type of out theorem of circle .in these class we are going to discuss about these theorem.

Tangent
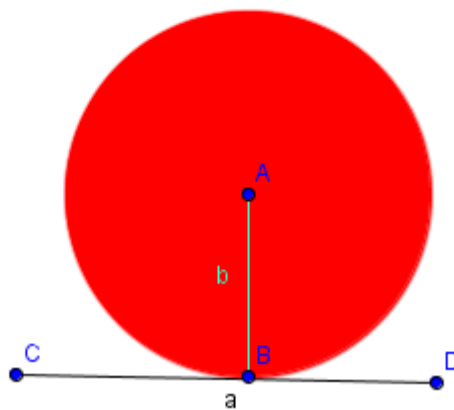
Prve that EG// CD
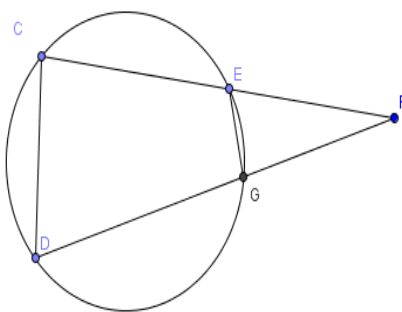
Given:-CDGE is a cyclic quadrilateral, FC=FD

To prve:- EG//CD

Proof:-

Statement	Reasns
1. $\angle ECD + \angle EGD = 180°$	1. Opposite angle of cyclic quadrilateral
2. $\angle CEG + \angle GEF = 180°$	2. being straight angle.
3. $\angle DCE = \angle GEF$	3. Frm 1 and 2.
4. EG//CD	4. From 3

Text text1

XP And XQ are tangents

XP = XQ (A length of two tangent to a circle at the point
        of contact from the same external point are equal)
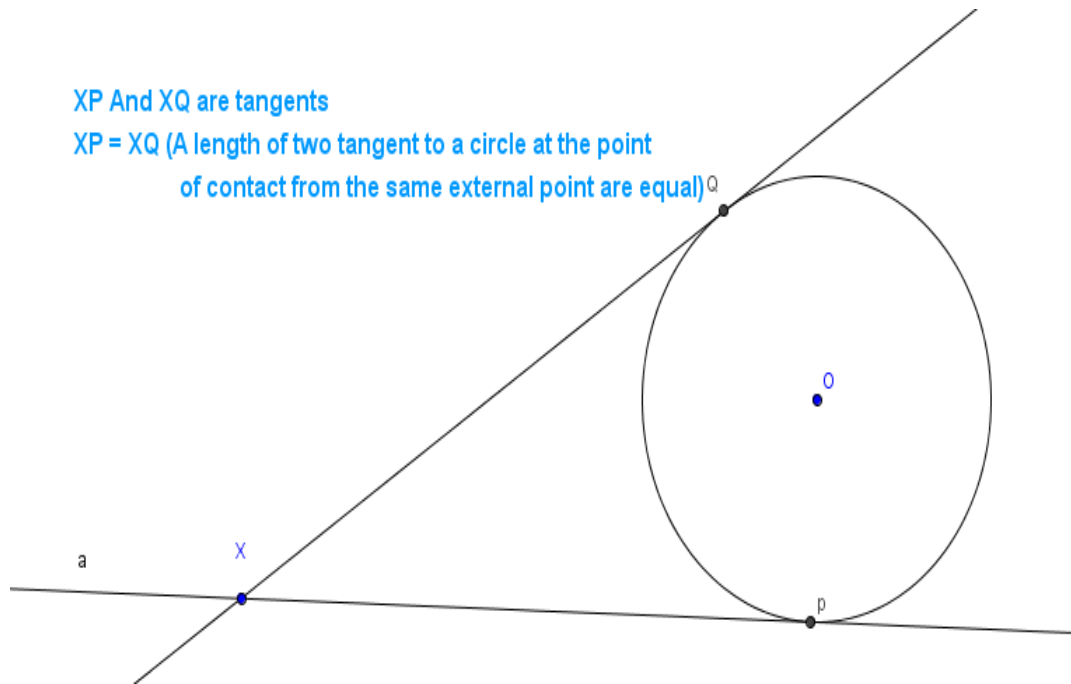
AOB is diameter

∡ACB = 90°(If the angle at the circumference is a right angle)

Here , α = 90°
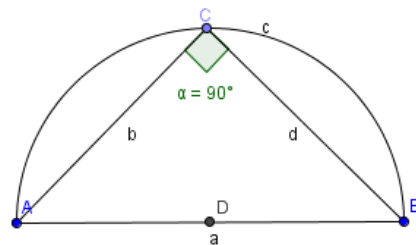
α = 90°

Find the measure of Arc. BCD
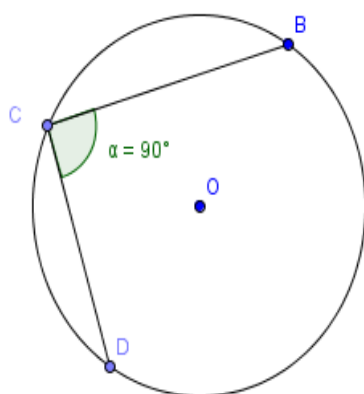
Solution,

$\angle BCD = 90°$

Since, The degree measure of arc BD = 2 $\angle BCD$

arc BD = 2*90°

arc BCD = 360 -180 = 180° Anns

Find the value of x
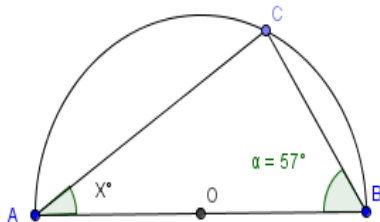
Slution

$\angle ACB = 90°$ (Angle of Semi circle)

$\angle ABC + \angle BCA + \angle CAB = 180$ (Three angle sum)

57° + 90° + x° =180

x° = 180 -147 = 33° Ans

Find the radius of the circle

A

20cm

C

B

16cm
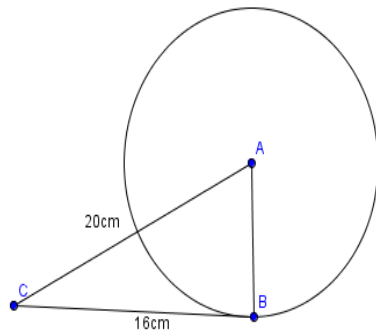
Solution

$\angle CBA = 90°$ (Radius is $\perp$ to the tangent)

$AB = \sqrt{(AC^2 - BC^2)}$

$AB = $ ....=12cm Ans
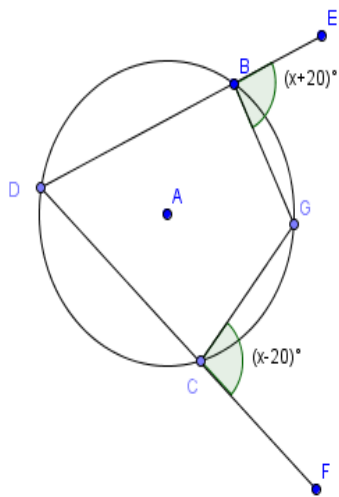
Episode six

Today is the final day of our Section , today we will talk about the experimental

verification and reaming out theorem application , we had followed the some rule at

first we must state the problem and

Drawing the More then two figure. We generalize the problem and write the
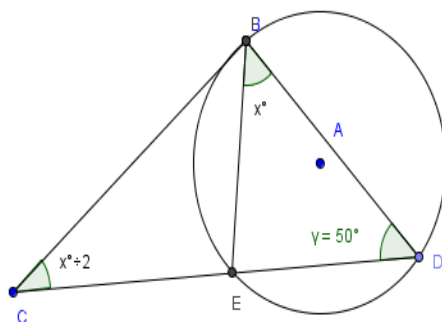
conclusion.

Find the value of x°

Solution,

∡DBG = ∡GCF (Exterior angle and opposite interior angle cyclic quad. ABCD)

∡DBG + ∡GBE = 180 (Str angle)

········ Text text3 ···············

x = 90°

Find the value of x°

Solution,

∡CBE = ∡BDE (Angle in alternates segement)

∡CBE =50°

2)   ∡BCE + ∡CBD + ∡BDE = 180 (Sum of angle of triangle)

(x°÷2) + (x° +30°) +30° = 180°

······································

x° = 80° Ans

Find the value f x°
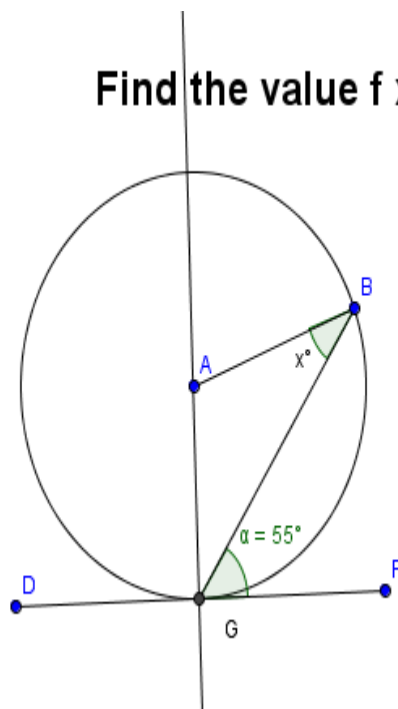
Solution,

$$\sphericalangle AGB = 90° - \sphericalangle BGF \ (AG \perp DGF)$$

Text text2 B = 35°

$$\sphericalangle AGB = \sphericalangle ABG \ (AG = AB)$$

$$\sphericalangle ABG = 35° \ Ans$$

Now, the last episode of these section is

Verify experimentally that the angles in the same segment of the circle are equal
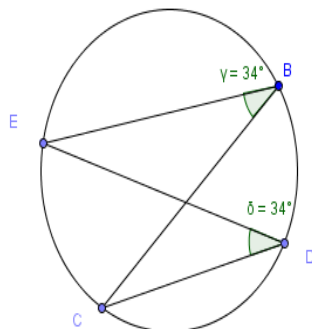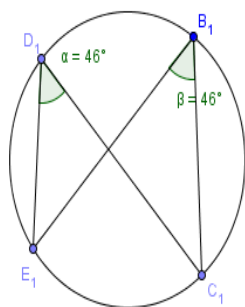
End of the section of class and thanking for the all student for actively participant of

learning .

Episode Seven

Theorem related problems:

```
▶ Graphics

    Prove that the parallelograms on the same base and between the same parallels are equal in area.
    Given:- Parallelogram ABCD and ABEF are in the same base and same parallel line.
     To Prove:- Parm. ABCD=Parm. ABEF in area.

                                          Proof:
                                          Statement                    Reasons
                                          1.  In ΔADF and ΔBCE         1.
                                          i)AD=BC                      i) opposite side of parallelogram
                                          ii) ⊀DFA=⊀CEB                ii) Corresponding angle
                                          iii) Text text2  E           iii) Corresponding angle
                                          2. ΔADF≡ΔBEC                 2. AAS axiom.
                                          3. ΔADF+trap ABCF=ΔBEC+trap ABCF
                                                                       3. Addition equal part
                                          4. ▭ABCD=▭ABEF              4. Whole part axiom.
```
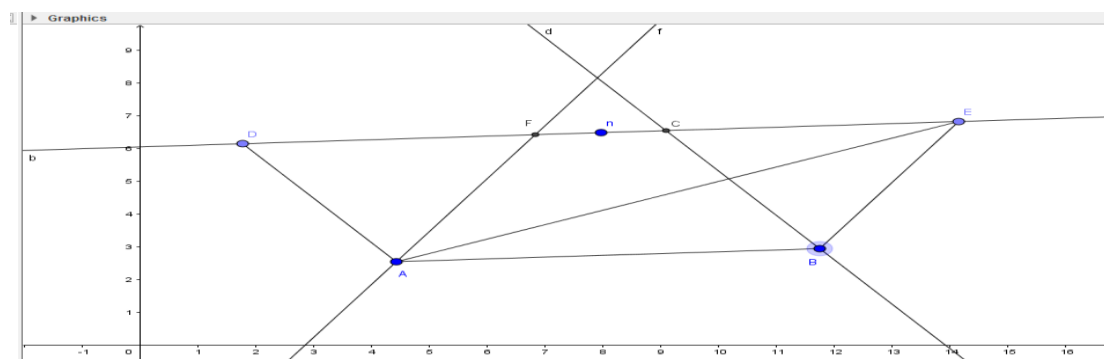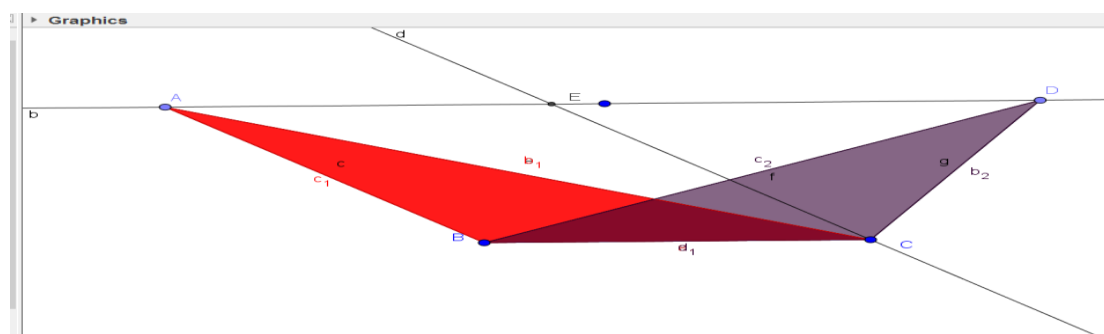
will be discuss about the theorem and concept will be develop in the class.

and for the next theorem content will be discuss as:

Finally the relation of the triangle standing on the same base and same parallel line are equal in area.

APPENDIX- H

Questionnaires to find the perception of the student about the GeoGebra.

Student's perception on GeoGebra in the learning of geometry

Attempt all the questions. (Tick the best answer)   Time:- 10 min

1. I was excited while using GeoGebra in learning geometry.

    a. Yes   b. No

2. I learnt a lot of geometry concept using GeoGebra software.

    a. Yes   b. No

3. I felt confident to solve the problems using the GeoGebra.

    a. Yes   b. No

4. I was very engaged in the learning process at the classroom.

    a. Yes   b. No

5. I benefited a lot through the teacher-students interaction

    a. Yes   b. No

6. I was able to visualize and answer the questions after each activity

    a. Yes   b. No

7. I was able to think positively for the geometry concept.

    a. Yes   b. No

8. I was able to solve the problems critically.

    a. Yes   b. No

9. I enjoyed learning mathematics much more using GeoGebra.

    a. Yes   b. No

10. I was able to find the better connections between previous learning and new learning.

    a. Yes   b. No

APPENDIX-I

Statistical Formula Used in Data Collection and Analysis Procedure

S.N.	Subject	Notation	Formula
1.	Mean	$\bar{x}$	$$\frac{\sum x}{N}$$
2.	Variance	S^2	$\frac{\sum(x-\bar{x})^2}{N}-(\frac{\sum(x-\bar{x})}{N})^2$
3.	Pooled Variance	$S_p{}^2$	$$\frac{(n_1-1)S_1^2+(n_2-1)S_2^2}{n_1+n_2-2}$$
4.	Standard Deviation	S	$$\sqrt{\frac{\sum(x-\bar{x})^2}{N}-(\frac{(x-\bar{x})}{N})2}$$
5.	Pearsons's Correlation Coefficient	r_{xy}	$$\frac{N\sum xy-\sum x\sum y}{\sqrt{N\sum x^2-(\sum x)^2}\sqrt{N\sum y^2-(\sum y)^2}}$$
6.	Defficulty Level of Item test	$P\%$	$\left(\frac{R_U-R_L}{N}X100\right)\%$ where R_u and R_l are the number of correct response given by upper 27% student and lower 27% student respectively. N is the total number of upper and lower 27% students.
7.	Discrimination index of Item	D	$$\left(\frac{R_U-R_L}{\frac{N}{2}}\right)$$
8.	Reliability Coefficient	r_{tt}	$$\frac{2r_{xy}}{1+r_{xy}}$$