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The Effect of Group Guided Discovery Approach on the Performance of Students in Geometry

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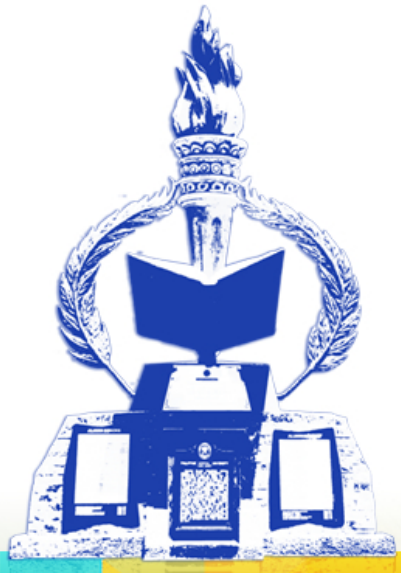

Philippine Normal University
National Center for Teacher Education

THE EFFECT OF GROUP GUIDED DISCOVERY APPROACH ON THE PERFORMANCE OF STUDENTS IN GEOMETRY

A SPECIAL PROJECT

Presented to the
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by
LUZVIMINDA J. ACHERA
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Abstract

Name : **Luzviminda J. Achera**

Title : **The Effect of Group Guided Discovery Approach on the Performance of Students in Geometry**

Key Concept : **Improve the Performance of Students in Geometry**

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Adviser : **Dr. Gladys C. Nivera**

This study aims to examine the effect of group guided discovery approach on the performance of students in Geometry of Malinta National High School for school year 2012-2013. The study used the quasi- experimental approach with non-equivalent control group pretest/posttest design. The sample of the study consisted of 92 students, half of whom were taught using the group guided discovery approach, and the other half using the traditional lecture approach of teaching. The experiment lasted for two months during the fourth grading period.

To determine the mathematical performances between the defined groups the percentage, mean, and the t- test for dependent and independent means were used. The study showed that the performance in Geometry of those students taught using group guided discovery was significantly higher than those students taught using the traditional lecture approach. Thus, the study concluded that group guided discovery approach was more effective than the traditional approach.

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CHAPTER ONE

The Problem and Its Setting

I. Introduction

According to Plato, as cited by Static (1986), those who are by nature good at calculation, as one might say, are naturally sharp in every study and those who are less adept at it, if they are educated and trained in this study, nevertheless improve and become sharper than they were (Indiogine, 2009). In other words, mathematics has a great influence in all areas of studies. In fact, De Leon (2004) claims that mathematics education is the window to success, understanding, appreciating, and accepting diversity.

A number of methods to improve the performance of students in mathematics have been discussed such as experimentation, cooperative learning, questioning, repetition, and manipulation. Some of them are recommended for application, others are disapproved and some have been recommended for use but with caution. The teacher has to make his/her own choice based on the available methods.

Salazar (2008) claimed that students learn best if they are allowed to think rather than just to read and to listen. She further argued that students learn and achieve more, behave better, and like learning better when they are permitted to learn through their sociological preferences.

Many researchers such as Brosnahan (2001) and Mayer (2004) have recommended that traditional ways related to teaching should be substituted by more innovative ones. Among those innovative strategies are guided discovery, which is based on the extent of students' involvement in classroom activities under the guidance of the teacher and how much the teacher activates student's thinking processes.

Since guided discovery is a student-centered activity, it would be difficult for some students to adjust to it because some are less competent and others lack confidence in their own ideas. Guided discovery is also time-consuming (Domitrascu, 2004). Therefore, to solve this problem, students must work in groups.

According to De Leon (2004), group brainstorming sessions bring several minds together to work on a problem, thus increasing the chances that a fruitful idea will come up. Even when a student first gets an idea from another student, he/she sees the idea in the context of intense thought about a problem. Usually the idea is only partly formed when it comes up in a brainstorming session, so the students must complete it either as a group or on their own. Thus students have the tendency to learn better from an idea they first met in a group brainstorming session than they first encounter in a lecture.

In this study, the researcher considered the two strategies- the group work and guided discovery approach to find out if these teaching strategies in teaching Geometry

will improve students' proficiency in Geometry. The combined strategies were called the group guided discovery approach.

The group guided discovery approach using the concepts learned from lectures and other researches inspired the researcher to engage in this study. This research is geared towards the improvement of students' performance not only in Geometry but also in other branches of Mathematics.

Theoretical Bases

Bruner is considered as the father of guided discovery (Thorsett 2002). According to Bruner, as summarized in Honebein & Duffy (1993), the teacher should try and encourage students to construct hypothesis, make decisions, and discover principles by themselves. The teacher's task is to translate information to be learned into a format appropriate to the students' current state of understanding and organize it in a spiral manner so that the students continually build upon what they have already learned (El-Kalout 2010).

Mayer (2004) claimed that to hold students' interest, the teacher can allow the students to take part in choosing the purpose of the activity. In fact, a class discussion that is carefully facilitated by the teacher regarding the purpose of a discovery activity can yield wonderful results. The key is to provide a context that students can operate within and give them a goal for their activity. As long as the goal holds the students' interest, they will be driven enough to continue with the discovery process.

Since guided discovery is a student-centered activity, it will be difficult for some students to adjust to it and it is time consuming. Therefore to solve this problem, students must work within a group for the activity (Flahive, 2003).

According to Vygotsky (1978), a prominent psychologist, in his Social Development Theory, social interaction precedes cognitive development. Social interaction plays a fundamental role in the process of cognitive development. He believes that every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then within the child (intrapsychological). Much learning by the child occurs through social interaction within a group. Vygotsky refers to this as a co-operative or collaborative dialogue. The child seeks to answer the guided question with the help of his group mates and through the guidance of the teacher (Mcleod, 2012).

Vygotsky views interaction with peers as an effective way of developing skills and strategies. He suggests that teachers who use cooperative learning exercises help the less competent students develop because of their more skillful peers -- within the zone of proximal development (Zaretskii, 2009).

The group guided discovery is an approach to teach Geometry. It focuses on the students' discovery process. According to Flahive (2003), in this approach, students

work cooperatively by answering the guided questions. Teachers attempt to involve students in the crucial elements of mathematical discovery and discourse -- conjecturing, careful reasoning, and building validating arguments that could be scrutinized by others.

Since high school geometry is typically the first time that a student encounters formal proofs, this can obviously present some difficulties. According to Salazar (2008) it would be easier for students if they had encountered informal proofs and were required to justify their statements and reasoning. According to Flahive (2003) the group guided discovery approach will lead the student in a step-by-step manner to identify important theorems and results. This lets students become familiar with the concepts little by little, and constantly keep building upon previous knowledge, just as it is normally done in Mathematics. In essence, the student is guided in his geometrical inquiries by the questions presented, as if a teacher was guiding him by hand.

According to El-Kahlout (2010) the aim of group guided discovery approach is to make students view mathematics as a way to approach knowledge with a rationally critical attitude and then learn rational thinking. The steps include defining the problem, expressing one's own view about the problem communication solution, testing own and others' ideas and hypothesis, and giving or sharing one's thinking with others for constructive criticism. According to Salazar (2008) this learning theory of Mathematics emphasizes that students may make errors during their learning and make progress in the process with errors and rational criticism.

In line with the theories mentioned, the researcher wanted to find out if the students can build their own knowledge easily and if students' retention is better if they are involved in the classroom activities under group guided discovery method.

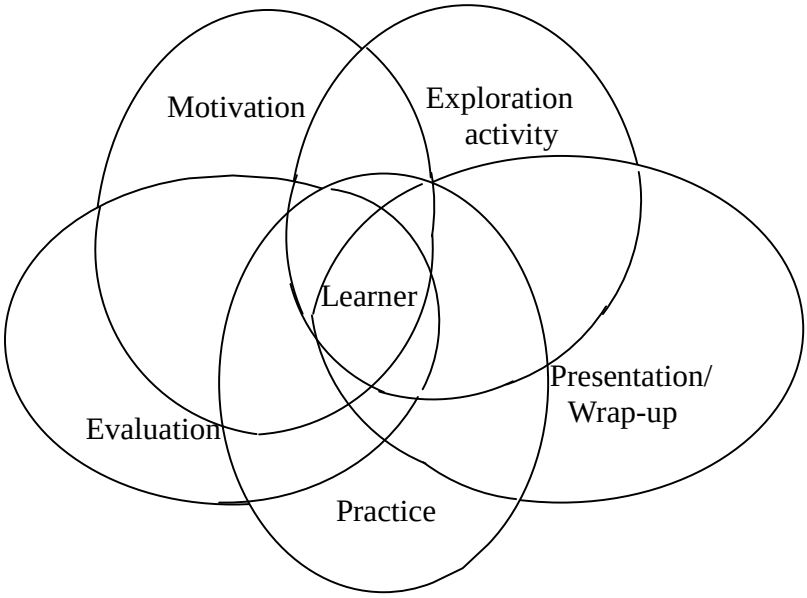


Figure 1
Conceptual Framework

Figure 1 shows the study's conceptual framework, including the stages of guided discovery and the relationship between and among the different stages

.

Motivation – In this stage, the teacher posed initial questions to prepare the students for the lesson. The teacher helped the students to recall information from their own experience to link the previously learned material with the new subject matter. This stage is very essential to get the students' attention and to help in bridging the gap in learning by activating students' prior knowledge for them to absorb the new material.

Exploration Activity – The students worked in groups. During the group work, the teacher went around from group to group, listened to their discussions, encouraged them if the direction was right or otherwise asked questions to steer them on to a more productive path, requested more details or further justification. At this stage, each member of the group held a copy of the activity sheet. On their own the students discussed ideas that emerged within the group as they worked through the activity sheet. The activity sheets were checked after the presentation to ensure participation of each member and corresponding points would be given. Students were asked to compile the activity sheet in a portfolio. Once students had worked through the activity sheet successfully, the class was ready to move onto their presentation.

Presentation- This was the stage where the students discussed their solution to the problem to the class. In each activity, one member of the group was required to present and discuss their answers.

Wrap up- The wrap up came after one objective of the lesson was presented by group/groups followed by another group/groups for another objectives to make sure that the students clearly see and meet the objective of the lesson. The teacher guided the students through follow-up questions.

Practice- Here, an extension of concepts and generalization of ideas was necessary. The students were given another problem to ensure mastery of the lesson.

Evaluation- The teacher measured the understanding of the students through the pencil and paper researcher-made test. The test consisted of multiple choice, identification, and problem-solving items.

Each lesson took two to three days to complete. The first day was devoted to the motivation or review and was followed by the exploration of the activity. In the second day or third day the students presented their output before the wrap-up, practice, and evaluation.

Statement of the problem

This study was conducted to determine the effect of group guided discovery approach on students' performance in Geometry.

Specifically, this study sought to answer the following questions:

1. What are the mathematical performances of the students who belong to the control group and the experimental group before and after the use of group guided discovery method and traditional lecture method?

2. Is there a significant difference between the pretest mean scores of the experimental and control groups?

3. Is there a significant difference between the pretest and posttest mean scores of the

   3.1. control group; and

   3.2. experimental group?

4. Is there a significant difference between the posttest mean scores of the experimental and control groups?

5. What are the implications of group guided discovery on the students' performance towards geometry?

Hypothesis

The following hypotheses were considered in the study:

1. There is no significant difference between the pretest mean scores of the experimental and control groups.
2. There is no significant difference between the pretest and posttest mean scores of the experimental and control group.
3. There is no significant difference between the posttest mean scores of the experimental and control group.

Scope and Limitation of the Study

This study was conducted in Malinta National High School, a public school located at St. Jude Subd., Malinta, Valenzuela City. The respondents selected were third year students of academic year 2012-2013, who belonged to two heterogeneous sections. This study covered two topics, namely circles and plane coordinate Geometry.

The researcher would like to find out the effectiveness of group guided discovery method of teaching on the performance of students' in Geometry.

This research was limited to the information gathered from the achievement test used to determine the students' performance.

Significance of the Study

The result of this study is significant to the following:

School/ Administrator. The insights gained from the study can help the school administrator in planning strategies to improve the instruction in Geometry.

Teachers. This study may encourage other teachers in adapting group guided discovery method not only in Geometry but in other subject areas as well.

Students. The study can help the students to become active learners because they will be guided in discovering concepts rather than being told. In line with this, developing such instructional units can be useful for students because there is an assurance that the students will develop the expected competences.

Other Researchers. This study can serve as a supplement or an additional resource material to research endeavors in group guided discovery.

Definition of Terms

For a better understanding of this study the following terms are hereby defined conceptually and operationally.

Control Group. This term refers to the group of students who were taught Geometry using the traditional method during the experimental period of one grading period.

Experimental Group. This term refers to the group of students who were taught using the group guided discovery method during the experimental period of one grading period.

Group Guided Discovery. It is an instructional approach based on leading questions and problem-framing that guide students to obtain knowledge and discover

relations and concepts by getting involved in the group interaction where the teacher helps them to be more active and more responsible for their learning (Flahive, 2003).In this study, it is the teaching strategy used to improve the performance of students in Geometry.

Performance Test. It is a 30 item multiple choice test on circles and coordinate geometry designed to measure the effect of group guided discovery that occurs under partially known as controlled condition. In this study, it was used to measure the performance of the students for one grading period.

Traditional Approach. It is an instructional approach which is often associated with the acquisition of factual knowledge, and memorization of definition, formulas, and series of rules to derive an answer (Forio 2009). In this study, it refers to the method of teaching Mathematics using the method characterized by the teacher dominated talk and with minimal student-teacher interaction.

CHAPTER TWO

Review of Related Literature

This chapter presents the literature associated to this study. It focuses on mathematics teaching, guided discovery, group guided discovery, questions on group guided discovery, and role of the teachers. It is the foundation of the researcher in establishing facts in the study.

Mathematics teaching

What are the main goals of mathematics education in schools? Simply stated, there is one main goal – the mathematization of the child's thought processes (Naidu, 2013). Mathematization means "to reduce". In the words of David Wheeler, it is "more useful to know how to mathematize than to know a lot of mathematics". (National Council of Educational Research and Training, 2006).

Nowadays the most common strategies in teaching mathematics are exposition, practice and consolidation, and discussion (High School Mathematics Education Group 1996; Bernardo, Salazar Clemena, and Prudente 2000).

The teaching strategies perceived to be most effective by Science and Mathematics teachers of schools identified as benchmarks in teaching and learning practices were (1)hands-on experience that brings students to their fullest learning capacity because they depend on themselves, (2)cooperative learning because they can share better knowledge when they work in groups rather than when they work

alone, and (3)self-discovery because it enhances students' learning capability (Forio, 2009).

Salazar (2008) stressed that activities that are student-centered help the students learn not primarily answers but how to reflect on, characterize and discuss problems, and how, on their initiative, they can find valid answers.

Furthermore, Antonio (2011) argued that in Mathematics, students need to construct their own understanding of each mathematical concept, so that the primary role of teaching is not to lecture, explain, or otherwise attempt to transfer mathematical knowledge, but to create situations for students that will foster them in making the necessary mental constructions.

According to Mayer, (2004, p. 88) "guided discovery is one of the teaching techniques represented by encouraging students to become more active in learning through answering a chain of questions or solving problems designed in order to reach the general concept."

Guided Discovery

The main features of guided discovery are learning how to learn through the process of discovery and the exploration of knowledge coupled with the responsibility

of the learner. This helps the learner to master the content needed for understanding (Aithal, 2011).

According to Spencer (1999), the key features of guided discovery are as follows: (1) a context for students' learning is chosen to suit the learning outcomes, (2) students have the responsibility for exploration of content necessary for understanding through self-directed learning, (3) study guides are used to facilitate and guide students during their learning, (4) understanding is reinforced through application of problem-oriented, task-based, and work-related experiences, and (5) guided discovery can be enhanced with various tools. One of these tools is simulation. Simulation happens when the teacher provides students with examples and hints to help them understand the problems and continue in following the instructions in the guided discovery (El-kalout, 2010).

Discovery learning is most effective when the process is carefully structured and the students have prerequisite knowledge and skills (Akerson, 2007). It is said that students enjoy learning if they have complete participation in the lesson. According to Domitrascu (2008) by trying to solve the problems from the handouts, they can experience the “exhilaration and frustration” of the quest to prove something, and they definitely start to understand this component in the life of their Mathematics teachers.

Jawaharlal (2011) advanced that there is no learning if there is no invention that is personally meaningful to a student. Every learner should be provided an opportunity to reinvent. Guided discovery approach focuses on helping every student to reinvent

important concepts in their mind. Rote memorization and figuring out the right answer using blind techniques are not the ways to develop understanding.

Forio (2009) found out that the critical thinking of students was enhanced after using the discovery approach. Results of pretest and posttest of each group respectively showed significant increase in gains, implying that both methods were effective in improving critical thinking skills of students. But the computed t-test of difference in means between the results of the posttest of two groups showed a significant difference which meant that the experimental group was better than the traditional group in the development of the students' critical thinking skills.

In the study of Brosnahan (2001) on the effect of direct instruction and guided discovery teaching, he found out that students learn more when they are led through activities that allow them to discover concepts for themselves (guided discovery) than from the presentation of concepts by an instructor (direct instruction).

Consequently, guided discovery is defined as an instructional approach based on leading questions and problem-framing that guide students to obtain knowledge and discover relations and concepts by getting involved in the classroom interaction where the teacher helps them to be more active and more responsible for their learning. This is similar to providing a safe environment where children can make mistakes and learn from their failures.

Group Guided discovery in Mathematics

The study of Flahive (2003) discovered that guided-discovery technique can be taught in an individual work setting, but is mostly used collaboratively. This is due to the advantages that group discourse can provide to the discovery process. It is also characteristic of this teaching method for the instructor to encounter frustration from the students concerning their quest for this goal. This frustration is caused by students trying to overcome the confusion of understanding a new cognitive process. Facing and overcoming this confusion is a

necessary process for the student to accomplish learning in guided-discovery.

According to Korey (2004), guided discovery conjoins two strategies self-paced learning and group work in an effort to make learning more efficient for all students. The careful structured problem sequence in guided discovery is designed to guide students step-by-step through the material, so that they construct the mathematical concepts in a cyclical "bottom up" approach, instead of receiving it in the "top down" lecture method (and then hoping to deconstruct and understand by solving problems).The workshop format emphasizes hands-on guided discovery experience in the role of the student which is notably successful in communicating both the teaching method and the nature of the student experience.

El- Kahlout (2010) emphasized that the use of group work in classroom second language learning has long been supported by sound pedagogical arguments. Provided careful attention is paid to the structure of

tasks students work on together, the negotiation work possible in group activity makes it an attractive alternative to the teacher-led "lockstep" mode and an available classroom substitute for individual conversations.

Gapusan (1999) summarized the pedagogical importance of group work in five points: (1)it helps individualize instructions, (2) it improves the quality of students' talk, (3) it increases language practice opportunities, (4) it promotes a positive affective climate, and (5) it motivates student.

Flahive (2003) believed the learning strategy of group discovery is based on the premise that most students learn well from working co-operatively with peers. Unlike many classes in which an expository lecture is the primary medium for conveying information, students in group discovery classes are actively involved in their own learning during class as well as outside the classroom.

Domitrascu (2004) agreed that alternating lecturing with group work is an effective modality to keep students' thoughts more focused on the material and less prone to wander outside of the classroom.

Since this study is based on group guided discovery approach, the researcher planned her lesson activities to be carried out through group work and she designed worksheets in order to let students work in groups during exploration. However important group work is careful attention of the

teacher during students' work is very important. The biggest problem is the tendency of students to drift away from the task of working on their activities. To address this problem, Gillies & Ashaman (1998) suggested the following techniques in order to organize the students' work as follows: (1) introduce group work with short simple task, (2) give students a clear and specific task for the group work activity, (3) have students practice moving into and out of the group, (4) seat partners together, (5) specify an amount of time students are allowed to complete the task and keep it short, (6) require students to produce a written product during group work activity, and (7) monitor the students while they work (Yucel, 2004).

Moreover, Domitrascu (2004) stressed that to come up with the best results, each student should have copy of the activity sheet/handouts which contain the following: (1) examples of essential concepts (possibly discussed in the lecturing part of the class), (2) non-examples or counterexamples, (3) short applications in order to enforce the existing acquisitions, and (4) hints or clear decomposition of more complicated results in smaller more manageable parts.

From the above studies on group guided discovery, the researcher concludes that it is a student-centered approach based on activating learners' role in the classroom activities and leads to achieving the aims of the teaching and learning process.

In addition, group guided discovery approach helps in achieving the goals of education because success in discovery enhances students' mental efficiency and helps in overcoming obstacles, gaining knowledge by themselves and as a group.

Questions in Group Guided Discovery

Bearing in mind the assumption that engaging the students is essential in motivating and helping them to establish their own personal connection to the intended learning, the researcher paid great attention to the questions which would lead students to certain points and at the end to discovery.

In this respect, Yucel (2004) affirmed that guided discovery also allows the teachers to employ good coaching skills as they guide the students to understand or apply new learning where the main tools of assessment are questions. So the aim of the questions is not to test but to guide the students and direct their attention to the important points in the text.

El-Kahlout (2010) claimed that questions are similar to a 'signpost' at a crossroads that show travelers where to go. Questions lead students particularly when they work together as a group. It is helpful to give students a question or a task before they answer. This gives a specific reason for solving. They work more purposefully in order to answer or complete the task .

Kidman, (2010) concluded that the teacher asks questions requiring the students to think, read, study, ponder and reason. When the students respond, the teacher expands, develops and enlarges, and illustrates the point. Discussion is the important technique. However, it is not "open" discussion where you are soliciting everyone's opinion. The teacher, who is a guide, a facilitator, and a leader through questions, achieves the target. The teacher is accountable to keep the class on track toward specific objectives of the lesson.

Ozcan (2010) assumed that the teacher must be clever in the art of asking meaningful questions. This will give students the opportunity to practice problem-solving and will help them become more capable of solving problems that arise in learning sessions. The use of low-order and high-order questions is necessary during learning sessions. It is important for teachers to understand both types of questions and to apply them appropriately. Use of high-order questions will provide students more opportunities for self-evaluation.

The researcher believes that the teacher has to carry out questioning carefully and at a suitable time during the lesson to achieve the purpose successfully. The art of questioning is considered to be the main factor in discovering the concept of the lesson. So the researcher designed the lesson plan for discovering the concepts based on leading questions. The "leading questions" are questions that suggest the answer or contain the information which the examiner is looking for.

The researcher thinks that leading questions are important because they:(1) activate students and keep them active all the time, (2)they make students respond with evidence from the text, (3)they lead student to check and feedback which helps in building new knowledge about the world, (4)help the students comprehend the message that the writer wants to convey and (5)transfer the knowledge gained from the text and connect it with the world around.

In other words, the leading questions in the guided discovery lessons help in relating the text with the students and in discovering mathematical concepts.

Role of the Teacher in Group Guided discovery

Nowadays, the teaching and learning process becomes more and more student-centered. Despite that, the teacher still plays a great role in the process of interaction, either between the teacher and the students or between the students or between the students and the classroom environment.

El-Kahlout (2010) argued that students will often have misconceptions and are unaware that they have them. It is the teacher's job to draw these out and make them visible to the students. Without guidance, students will be unable to relate their discovery activity to their misconception and thus give up.

Vanionu (2010) explained that the role of the teacher is to provide opportunities for students to reflect upon their own thinking. One of those opportunities arises when it

is time for the students to evaluate their own discovery against scientific ideas. Without the teacher's guidance, this would not happen.

Salazar (2008) identified that the teacher must go around to each group to extend guidance during the activity. There are students who are completely lost and have no prior knowledge. The teacher must not let the students have misconceptions about the particular idea. The teacher must discover possible roadblocks (difficulties) to discover learning ahead of time and prepare well-constructed questions that can help students connect the activity to prior knowledge or lead them to a path towards the solution.

Mayer (2004) mentioned some disadvantages of the guided discovery as follows: (1) discovery can be a very time-consuming method, often taking much longer for information to be acquired than would occur with direct teaching,(2) discovery methods often require a resource-rich learning environment. Effective learning by discovery usually depends upon learners having adequate literacy, numeracy, independent study skills and self-management,(3) students may learn little from discovery activities if they lack an adequate knowledge base for interpreting their discoveries accurately, and (4) although students become actively involved, they may still not understand or recognize the underlying concept, rule or principle; in other words, activity does not necessarily equate with deep learning.(5)Young children often have difficulty in forming opinions, making predictions, or drawing conclusions from evidence. They have major problems with inductive reasoning; and (6) teachers are not

necessarily good at creating and managing discovery learning environments, resulting sometimes in poor outcomes.

The researcher concludes that class management of students' activities is very necessary in a guided discovery lesson. In addition, the materials must be carefully planned in advance and monitored to prevent chaos as students begin to investigate the intended knowledge. The students must be led towards the target of the discovery at every stage of the lesson. The teacher has to encourage them to share their predictions about the text and to distinguish between facts and opinion. Moreover, creating suitable learning environments is also one of the teacher's missions in a guided discovery reading lesson.

Flahive, (2003) enumerated the role of the teacher in group guided discovery teaching approach as follows: (1)to monitor the brainstorming session, (2) to help students work together in productive ways,(3) to give the students regular feedback about their written work and encourage (or require) the students to rewrite their work until it is both correct and coherent and (4) to help students discover the “big picture” through discussions of relationships among the problems and the main themes of the subject the students are developing.

In the light of what are mentioned above, the researcher summarized the role of the teacher in three points: (1) clarifying the wrong concepts for the students, (2)

framing activities and questions well, which lead students to discovery and (3) giving necessary support and help.

Synthesis

Guided discovery is an instructional approach, it focuses on the students' discovery process which is based on leading questions and problem-framing that guide students to obtain knowledge and discover relations and concepts. Some studies showed that in guided discovery, students learn more when they are led through an activity that allows them to discover concept than by presentation of concept by the teacher (Forio, 2009). However, some researchers found out that guided discovery is more effective when students work in groups because it increases learning, elevates self-esteem, and motivation, and opinion and discuss the answers.

Studies have found out that another facet of effective group guided discovery is the art of questioning and the role of the teacher (El–Kahlout, 2010). The teacher has to carry out questioning carefully and at a suitable time during the lesson to achieve the purpose successfully. The art of questioning is considered to be the main factor in discovering the concept of the lesson. It is cited in some studies that if questions or task given to the learners are not simple or do not match their ability, then learners tend to drift away. Also researchers such as Salazar (2008), Mayer (2004) and Flahive (2003) emphasized that teachers should guide the students all throughout the activity

in order to avoid misconception and misbehaving from the students who deserve all the necessary support and help.

CHAPTER THREE

Methodology

This chapter presents the research design, the description of the subjects, and the instruments and procedures used in this study.

Research Design

The researcher adopted a quasi-experimental approach using non-equivalent control group pretest/ posttest design because in this study the participants were not randomly assigned.

According to Harris et al. (2006) quasi-experiments are studies that aim to evaluate interventions that do not use randomization. Similar to randomized trials, quasi-experiments aim to demonstrate causality between an intervention and an outcome.

Two sections of third year students were used in the study. One section, the experimental group, was taught using the group guided discovery approach. The other group, the control, was taught using the traditional lecture method.

Since the proponent handled five sections of students that are heterogeneously grouped, two classes were chosen based on the results of the diagnostic test taken

before the class started in June 2012.The researcher chose the group with the closest score in the Mean Percentage Score 8.04 and 8.31.

Participants of the study

The 92 participants of this study were third year high school students taking Geometry in Malinta National High School (MNHS), a public school located inside St. Jude Subdivision of Malinta, Valenzuela City with a population of about 3000 students. It has large class sizes, high dropout rate and inadequate facilities, equipment, and materials. The research covered the fourth grading period of school year 2012-2013.

Research Instrument

The research instruments used in this study were as follows:

1. **Achievement Test -** The table of specification for the achievement test was constructed (see Appendix A). The total items were 30, 18 for easy items which is equal to 60% percent of the items, 9 for average items which is equal to 30% of the items and 3 for difficult questions which is 10% of the items. The achievement test(see Appendix B) which is used as pretest and posttest was content-validated using item-analysis procedure (see Appendix C).The test is also face-validated by a master teacher of Mathematics, a head-teacher of Mathematics and a teacher III in Mathematics (see Appendix F). The head teacher of Mathematics suggested to change some

items in question form. The master teacher and the teacher III in Mathematics asked the researcher to reconstruct confusing items.

2. **Guided Discovery Sheets-** Guided discovery sheets (see Appendix D) were prepared by the researcher. The guided discovery sheets were based on the lesson guides in Geometry prepared by Ateneo De Manila University. The researcher prepared 9 activity sheets or 9 lessons for the fourth grading. The coverage of the lesson was the fourth grading period wherein the topics were Circles and Plane Coordinate Geometry. The researcher asked her head teacher and one English teacher to check the lesson plan for its validity. The head teacher did some corrections on the content of the activity sheets and the English teacher did some corrections on the grammar of the activity (see Appendix I). Also the researcher tested the activity first to students not under the study. After this, the researcher made the necessary modifications and adjustments.

Evaluation scores

To get the scores for evaluation, each response was given a point value. The corresponding value of each score was as follows:

Table 1
Interval and Corresponding Verbal Interpretation of Mathematical Performance.

Scores	Verbal Interpretation
25-30	High Performance
19-24	Above Average performance
13-18	Average Performance
7-12	Below Average Performance
1-6	Low Performance

Table 2
Interval an Corresponding Verbal Interpretation of Group Performance on Group Guided Discovery.

Score	Interpretation
10 points	Met or exceeded the expectation for the objective of the lesson.
8 points	Presentations were well-prepared, missed some key ideas.
6 points	Presentations were adequate, but required more work to meet the standard expectations.
4 points	Presented outputs but only gave few correct answers.
2 point	Presented outputs but did not contribute or give correct answer.
0 point	No presentation of output.

Table 5 shows the corresponding score of the performance of each group (Domitrascu, 2004).After the presentation of the activity by the students, the teacher evaluated their group performance based on their presentation by using the rubric above.

Data Gathering Procedures

The researcher sent a letter of permission to the principal to conduct the study during the fourth grading period (see Appendix A). The table of specification was constructed for two topics: the Circle and Plane coordinate Geometry. The researcher-made 50 items which were tried out to 50 fourth year students, and only thirty items were retained from the 50 items (see Appendix C).The questions were adopted from a textbook in Geometry, the teacher's resources and some materials in the internet. The students who were under the study were the sections with closest mean score during the diagnostic test done before the start of classes. Before the fourth grading III- Daniel and III- Jeremiah were pretested to determine their knowledge of the subject. The lesson for each subject matter took two days. The first day focused on motivation and group activity. On the second day, the activity allowed each group to present their group work and their presentations scored (see table 5), followed by a wrap up for teachers and students and evaluation or seat works. After 9 lessons within two months of instruction, a posttest (see Appendix A) on Geometry was administered to the respondents. The pretest and posttest used the same test so that the degree of learning could be directly measured.

Statistical Treatment of Data

In order to facilitate the accuracy and reliability of interpretation of the data, the following statistical tools were used.

1. **Percentage**- It is used to describe the relationship of a part from the whole. The researcher used this to determine the profile of the students.

2. **Mean and standard deviation.** It is used to represent the level of performance of the respondents in Mathematics before and after the learning unit and the use of group guided discovery.

3. **T-test for dependent samples.** This was used to find if there is a significant difference between the pretest and posttest scores of the experimental group and the pretest and posttest scores control groups in the performance test.

4. **T-test for independent samples.** This was used to find out if there is a significant difference between the pretest scores of the experimental group and control group and posttest scores of the experimental group and control group in the performance test.

CHAPTER FOUR

Presentation, Analysis, and Interpretation of Data

This chapter presents the data gathered and analysis of the results of the investigation in order to elicit answers to the problems raised in this study.

Problem 1. **What are the mathematical performance of the students who belong to the control group and the experimental group before and after the use of group guided discovery method and traditional lecture method?**

Table 3 shows the distribution of the mathematical performance of respondents who belong to the control group.

Table 3
Frequency Distribution of the Respondents According to Pretest and Posttest of the Control Group

Scores	Interpretation	Control Group			
		Before		After	
		F	%	F	%
25 – 30	High Performance	0	0	5	10.87
19 – 24	Above Average Performance	0	0	10	21.74
13 – 18	Average Performance	15	32.61	21	45.65
7 – 12	Below Average Performance	31	67.39	10	21.74
1 – 6	Low Performance	0	0	0	0
Total		46	100	46	100
Mean		**9.46**		**14.80**	

A careful examination of table 3 shows that before the learning unit, 15 out of 46 or 32.61% of the respondents had average mathematical performance; 31 out of 46 or 61.39% had below average performance level. All the respondents had a mean score

of 9.56 which indicated below average performance in Mathematics before the learning unit.

Table 2 also shows that after two months of learning the concept of Geometry, particularly the circles and plane coordinated geometry, the students in the control group had increased their performance from a mean score of 9.46 to 14.80. Five (5) out of 46 or 10.87% of the respondents registered high performance; 10 out of 46 or 21.74% of the respondents remained above average mathematical performance; 21 out of 46, or 45.65% of the respondents had average performance; 10 out of 46 or 21.74% got below average performance. None of the students who belong to the group got low in mathematical performance. The control group had an average performance as indicated by the mean score of 14.80%.

Table 4 shows the distribution of the mathematical performance of respondents who belong to the group guided discovery.

Table 4
Frequency Distribution of the Respondents According to Pretest and Posttest of the Experimental Group

Scores	Interpretation	Experimental Group			
		Before		After	
		F	%	F	%
25 – 30	High Performance	0	0	11	23.91
19 – 24	Above Average Performance	0	0	23	.50
13 – 18	Average Performance	15	32.61	10	21.74
7 – 12	Below Average Performance	28	60.87	2	4.35
1 – 6	Low Performance	3	6.82	0	0
Total		46	100	46	100
Mean		**9.07**		**19.11**	

Table 4 shows the mathematical performance of the experimental group before the learning unit and treatment. Initially, 15 out of 46 or 32.61% of the respondents had average mathematical performance; 28 out of 46 or 64% had below average performance in Mathematics; 3 out of 46 or 6.82% of the respondents had low performance in Mathematics. Collectively, they had a mean score of 9.07, which also indicated a below average mathematical performance.

After the treatment (group guided discovery approach) was used in the experimental group, the researcher administered a posttest. Eleven (11) out of 46 students got high mathematical performance or 23.91% of the students; 23 out of 46 or 50% of the students had above average mathematical performance; 10 out 46 or 21.74% of the students received average performance in Mathematics. However, two

(2) out 46 or 4.35% remained below average mathematical performance. None of the students who belonged to the group scored low in their mathematical performance.

The experimental group had an above average mathematical performance as indicated by a mean score of 19.11.

Problem 2: Is there a significant difference between the pretest mean scores of the experimental and control groups?

Table 6 shows the comparison of the pretest of the control and experimental groups on the performance test.

Table 5
Comparison of the Pretest Mean Scores on the Performance Test of the Experimental and Control Group

Control Group III- Jeremiah		Experimental Group III- Daniel		T-test value	Critical Value at α=.05	Verbal Interpretation
SD	Mean	SD	Mean	0.0842	1.645	Not Significant
2.81	9.46	3.45	9.07			

It can be viewed from the table that the computed t-value is less than the critical value of 1.645 at 0.05 level of significance. This means that in terms of prior knowledge there is no significant difference in the Mathematics performance of the

students in the control and experimental groups. This indicates that the experimental and control groups were comparable at the start of the study.

Problem 3: Is there a significant difference between the pretest and posttest mean scores of the experimental and control groups?

a. control group; and

b. experimental group

Table 6 shows the comparison of the pretest and posttest of the control groups on the performance test.

Table 6
Comparison of the Pretest -Posttest Mean Scores on the Performance Test of the Control Group

Pretest		Posttest		T-test value	Critical Value at α=.05	Verbal Interpretation
SD	Mean	SD	Mean	5.89	1.645	Significant
2.81	9.46	5.50	14.80			

As shown on the table above, the computed t-test value of 5.89 is beyond the critical t-test value of 1.645 at α=.05 with degrees of freedom equal to 90. This means

that the pretest scores differed significantly from the posttest scores of the control group on the performance test.

Table 7 shows the comparison of the pretest and posttest of the control groups on the performance test.

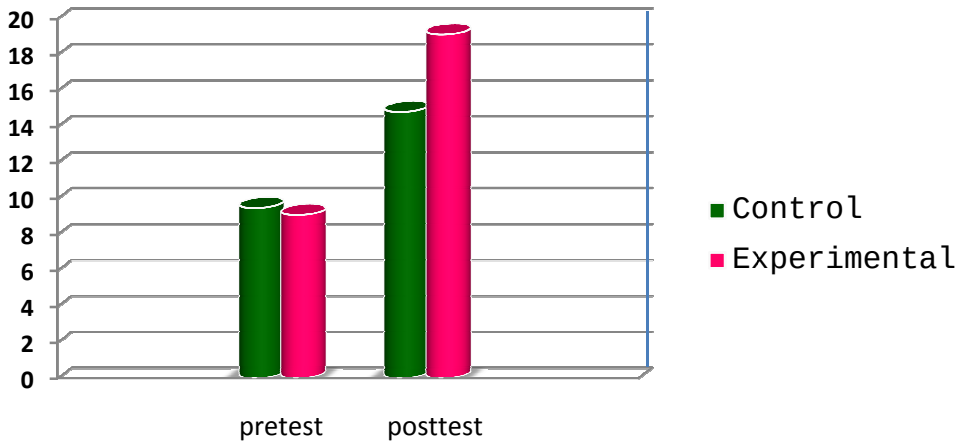
Table 7
Comparison of the Pretest -Posttest Mean Scores on the Performance Test of the Experimental Group

Pretest		Posttest		T-test value	Critical Value at α=.05	Verbal Interpretation
SD	Mean	SD	Mean	11.40	1.645	Significant
3.45	9.07	4.87	19.10			

As shown on the table above, the computed t-test value of 11.40 is beyond the critical t-test value of 1.645 at α=.05 with degrees of freedom equal to 90. This means that the pretest scores differed significantly from the posttest scores of the experimental group on the performance test. Clearly, it is an indication that the performance of the respondents after the experiment improved.

This indicates that the performance of the participants after the experiment improved significantly regardless of the treatment given.

Control Group and Experimental Group



Graph of Mean Scores of PreTest and PostTest of the Groups
Figure 3

Figure 3 above illustrates the big improvement in the scores of the experimental group compared to the control group in the pretest and posttest. It shows that students in the experimental group performed better than in the control group.

Problem 4: Is there a significant difference between posttest mean scores of the experimental and control groups?

Table 8 shows the comparison of the posttest mean score of the experimental and the control groups on the performance test.

Table 8
Comparison of the Posttest Mean Scores on the Performance Test of the Experimental and Control Group

Control Group III- Jeremiah		Experimental Group III- Daniel		T-test value	Critical Value at α=.05	Verbal Interpretation
SD	Mean	SD	Mean	5.46	1.645	Significant
5.50	14.80	4.87	19.10			

As shown on the table above, the computed t-test value of 5.46 is beyond the critical t-test value of 1.645 at α=.05 with degrees of freedom equal to 90. This means that there was a significant difference in the posttest means score on the performance test of the two groups. The performance of the students in the experimental group was better than the performance of the students in the control group.

Problem 5. What are the implications of group guided discovery on the students' performance towards geometry?

The results of the study suggest that, group guided discovery approach is an effective teaching strategy for Geometry. The result of pretest and posttest mean scores showed a significant difference between the performances of the students of experimental group and the students of the control group. Students among the group

guided discovery had higher scores compared to those students who underwent the traditional method of teaching. As one of the students said, “I like the group guided discovery because I personally discover the answer and sometimes with the help of my classmate. It is exciting because the questions help me to think and become responsible learner”. Another student also said, “At first I don’t like the method because it was difficult but later I enjoyed it because I experience to do a lot of errors which help me to remember the right answer”.

Students learn better when they are led through activities that allow them to discover concepts for themselves (guided discovery) than from the presentation of concepts by an instructor.

It was observed that students were motivated in learning through the activity. This is because the students worked cooperatively thus they helped one another and shared their own ideas in a certain topic. One student said, “I like to be in a group because I feel good when I share my ideas”. Other said, “I am afraid to ask question during class discussion because I am not comfortable to open it to the teacher but with group work, I can ask the things I can’t understand from the question”.

The group guided discovery methods of teaching helped the students to be active learners and that’s why retention is better as shown in their mathematical performance after the intervention.

CHAPTER FIVE

Summary of Findings, Conclusions, and Recommendations

This chapter presents the summary of the findings, conclusion, and the recommendation of the study.

This study aimed to examine the effect of group guided discovery approach on the performance of third year students in Geometry at Malinta National High School of the school year 2012-2013.

Specifically, this study sought to answer the following questions:

1. What are the mathematical performance of the students who belong to the control group and the experimental group before and after the use of group guided discovery method and traditional method of teaching?

2. Is there a significant difference between the pretest mean scores of the experimental and control groups?

3. Is there a significant difference between the pretest and posttest mean scores of the experimental and control groups?

4. Is there a significant difference between the posttest mean scores of the experimental and control groups?

5. What are the implications of group guided discovery on the students' performance towards Geometry?

A quasi-experimental design was used, which lasted for two months with 9 lessons on circles the plane coordinate geometry. There were two groups - the experimental group and the control group. Both groups were taught about the concept of circles and plane coordinate geometry. The experimental group was taught through group guided discovery approach and the control group was taught using the traditional lecture method.

The instrument used in data gathering was the performance test. It was used as the pretest and the posttest. To ensure the validity of the performance test, it was face validated and content validated. The population frame of the study was composed of ninety- two (92) students. The intervention- the guided discovery sheets were checked and validated by the head teacher and an English teacher. The following statistics and statistical tests were used: frequency distribution, percentage, ranking, weighted mean, and t-test of independent means. The significant difference between independent means was tested at critical value of 0.05 with due consideration of 90 degrees of freedom.

Summary of Findings

The initial mathematical performance of the students was below average as shown by the pretest results. After the learning unit and the use of intervention (group guided discovery approach), the control group had an average performance while the students who belonged to group guided discovery increased their mathematical performance from below average to above average. A significant difference on the mathematical performance of students between the control group and experimental group was registered in the computed t-test value of 3.98 which was beyond the critical value of 1.645 at 0.05 level of significance with 90 degrees of freedom. The students who belonged to the group guided discovery performed significantly better than those students who belonged to the control group. Consequently, the group guided discovery proved to be an effective intervention to help the students become active learners.

Conclusion

Based on the findings of the research, the following conclusions were reached:

1. The group taught using guided discovery approach performed better in Mathematics than the group taught using the traditional lecture method.

2. The use of group guided discovery approach significantly and positively affects the performance of the students in Geometry.

3. Students are more interested and motivated to do the activities in group guided discovery.

Recommendations

On the basis of the findings and conclusions of this research, the following recommendations are offered:

1. Teachers should attend seminars, workshops, conferences, and other professional development gatherings particularly those related to construction of guided questions as a part of group guided discovery approach.

2. Mathematics teachers should devise and implement group guided discovery approach to further improve students' performance in Mathematics.

3. Further researches should be conducted on the effectiveness of group guided discovery at different year levels to verify the result of this study.

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Appendix A
Letter of Approval

DepED
DEPARTMENT OF EDUCATION
NATIONAL CAPITAL REGION
DIVISION OF CITY SCHOOLS - VALENZUELA
PIO VALENZUELA ST., MARULAS. VALENZUELA CITY
MALINTA NATIONAL HIGH SCHOOL
ST. JUDE SUBD., MALITA, VALENZUELA CITY

January 3, 2013

GENINDINA M. SUMBILLO, Ed. D.
Principal IV

Dear Madam:

I would like to ask permission to conduct a study with a working title “The Effect of Group Guided Discovery Approach on the Performance of Students in Geometry ”. This will involve the third year students, I am presently handling.

Thank you very much.

Respectfully yours,

LUZVIMINDA J. ACHERA
Secondary School Teacher I

Approved:

GENINDINA M. SUMBILLO, Ed. D.

Appendix B
Table of Specification

Topics/ Competencies	Easy	Average	Difficult	Total
Circles				
1. Review the definition of a circle and the terms related to it.	1,2,3,4,5,			5
2. Identify and determine arcs and angles of a circle.	6,7	8,9, 12,13	10,11	8
3.Determine the angles formed by tangent and secant line.	14	15,16		3
Cartesian Coordinate Plane				
4. Review of the Cartesian coordinate plane.	17,18			2
5. Identify and determine the slope of line and intercepts of a line.	19,20 24,25			5
6. Determine equation of a line.		22,23		2
7. Apply the definition of parallel and perpendicular lines.		26		1
8. Derive and state the distance formula using the Pythagorean Theorem.			27	1
9. Identify the center and radius of a circle.	28,29,30			3
Total	18	9	3	30

Appendix C
Achievement Test

Direction: Write the letter corresponding to the correct answer.

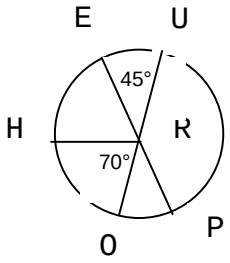
_____ 1. Which of the following statements is true?
A. A radius is a chord of a circle.
B. A radius is a diameter of a circle.
C. All radii have the same measure.
D. All radii of a circle are congruent.

_____2. Which line is passing through two points of the circle?
A. Secant B. diameter C. tangent D. radius

_____3. From a stationary point, Billy throws four balls in four directions. Where each ball land determines the radius of another circle. What do the four circles have in common?
A. center point C. a diameter
B. a radius D. a tangent

_____4. What is the angle whose vertex is a point on the circle?
A.Chord B. arc C. central angle D. inscribed angle

For numbers 5 - 8
Given : Line segments EP and OU are diameters.



_____5. Which is a diameter?
A. $\overline{OU}$ B.$\overline{HR}$ C. $\overline{EP}$ D. $\overline{EP}$

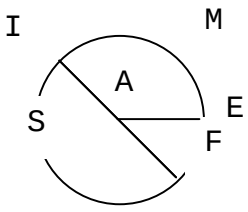
_____6. Which is a semicircle?
A. Arc EUO B. Arc UP C. Arc HOP D. Arc EOP

_____ 7. What is the measure of arc EU ?
A. 45° B. 55 ° C. 65° D. 75°

_____ 8. What is the measure of ∠HRE ?
A. 45° B. 55° C. 65° D. 75°

_____ 9. What is the measure of arc OP ?
A. 45° B. 55° C. 65° D. 75°

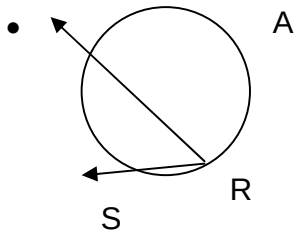
For numbers 6 – 11
Given: Line segment SM is a diameter.
Arc IM = 3x + 5, Arc IS = 2x,
Arc EM = 2x – 30, Arc EF = x



_____ 10. What is the measure of arc IS ?
A. 30° B. 40° C. 70° D. 110°

_____ 11. What is the measure of ∠MAF ?
A. 30° B. 40° C. 75° D. 110°

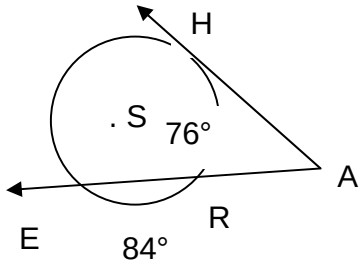
For numbers 12 & 13
Given :



_____ 12. If measure of arc CAR = 250°, what is the measure of arc CR ?
A. 55° B. 110° C. 125° D. 250°

_____ 13. If measure of arc CAR = 250°, what is the m ∠CRS ?
A. 55° B. 110° C. 125° D. 250°

For numbers 14 – 18
Given :



_____ 14. What are the intercepted arcs of ∠A ?
A. Arcs HR and RE B. Arcs RE and EH
C. Arcs EH and ER D. Arcs HR &HE

_____ 15. What is the measure of arc HE ?
A. 62° B. 76° C. 160° D. 200°

_____ 16. What is the measure of ∠A ?
A. 62° B. 76° C. 160° D. 200°

_____ 17. What is the plane that is divided into 4 regions?
A. circles B. coordinate plane C. polygon D. y-axis

_____18. What is the ratio of the rise to the run?
A. x-intercept B. slope C. y- intercept D. vertex

_____19. What is the y –intercept of y= x+ 6?
A. 6 B. -6 C. 1 D. -1

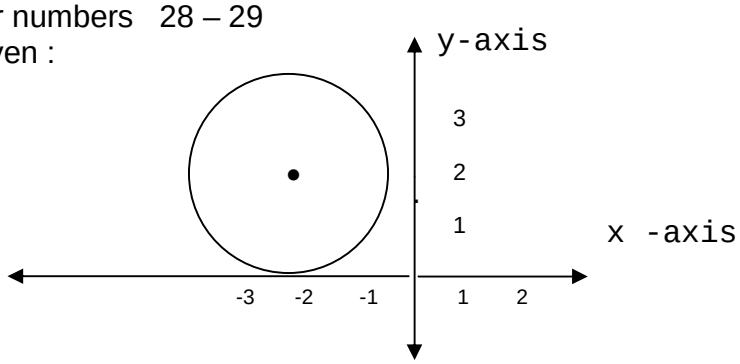
_____20. Find the distance of 10 and -2.
A. 8 B. 9 C. 12 D. -12

_____21. What is the slope of (3, 2) and (2, 1)?
A. 1 B. 2 C. -1 D. 3

_____22.Which is equation in the form of slope intercept form?
A.y+2=x B. y=3x+1 C. 2y=x D. 2y+3x=2
_____23. What is the equation of the line with a slope of 2 and y-intercept of 8.
A.y=2x+8 B. 2y= x+8 C. Y=8x+2 D. y=2x-8

_____24. What kind of line has a slope of zero?
A. vertical lines C. diagonal lines rises to left
B. horizontal lines D. diagonal lines rises to right
_____ 25. What kind of line with undefined slope?
A. Vertical lines C. diagonal lines rises to left
B. horizontal lines D. diagonal lines rises to left
_____26. What is the slope the line that is perpendicular to x+y =3?
A.1 B. -1 C. 3 D. 2
_____27. What is the distance from A (6,-1) and B (11,11)?
A. 13 B.12 C.14 D.15

For numbers 28 – 29
Given :



_____28. What is the coordinate of the center?
A. (-3, 2) B. (2, -2) C. (-2,2) D.(3,-2)
_____29. What is the radius on the figure?
A. 4 B. 2 C. 3 D. 1
_____30 . At what point does the circle on the right touches the x-axis?
A. (0,3) B. (-3,0) C. (0,-3) D. (0,2)

Appendix E
Face Validity of test

Name : BABIJIS, AILEEN G.
Degree: MAED-MATH
Position: HEAD TEACHER III-MATH

Direction: Underline the word agree or disagree to answer the question below.

1. Are the questions appropriate to the third year students? agree disagree
2. Are the questions clear?
   agree disagree
3. Are the choices relevant to the question? agree disagree
4. Are the questions lengthy?
   agree disagree
5. Do the questions reflect the higher order thinking skills? agree disagree
6. Are the questions grammatically correct? agree disagree
7. Can the exam be taken in one hour?
   agree disagree
8. Are the questions not repeated?
   agree disagree
9. Are the questions related to circles and plane geometry? agree disagree
10. Are the directions given easily understood?
    agree disagree

Proof-read and checked by: _____
Date:_____

Name : DE GUZMAN, JULIETA Z.
Degree: MAED-MATH
Position: TEACHER III-MATH

Direction: Underline the word agree or disagree to answer the question below.

1. Are the questions appropriate to the third year students? agree disagree
2. Are the questions clear? agree disagree
3. Are the choices relevant to the question? agree disagree
4. Are the questions lengthy? agree disagree
5. Do the questions reflect the higher order thinking skills? agree disagree
6. Are the questions grammatically correct? agree disagree
7. Can the exam be taken in one hour? agree disagree
8. Are the questions not repeated? agree disagree
9. Are the questions related to circles and plane geometry? agree disagree
10. Are the directions given easily understood? agree disagree

Proof-read and checked by: _____
Date:_____

Degree: DE LEON RODERICK D.
Degree: M.A.T- MATH
Position: MASTER TEACHER I

Direction: Underline the word agree or disagree to answer the question below.

1. Are the questions appropriate to the third year students? agree disagree
2. Are the questions clear?
   agree disagree
3. Are the choices relevant to the question? agree disagree
4. Are the questions lengthy?
   agree disagree
5. Do the questions reflect the higher order thinking skills? agree disagree
6. Are the questions grammatically correct? agree disagree
7. Can the exam be taken in one hour?
   agree disagree
8. Are the questions not repeated?
   agree disagree
9. Are the questions related to circles and plane geometry? agree disagree
10. Are the directions given easily understood? agree disagree

Proof-read and checked by: _____
Date:_____

Appendix F
Statistical Tools

Percentage

$$P = \frac{n}{N} x\ 100$$

Where: P – Percent

n - number of specified respondents

N - total number of respondents

Sample Mean

$$\bar{x} = \frac{\Sigma fx}{n}$$

Where: $\bar{x}$ - sample mean

f - frequency distribution

x - class mark

n - number of respondents on a sample

T-test for Independent Means

$$t = \frac{\overline{x_1} - \overline{x_2}}{\sqrt{\frac{(n_1 - 1)s_1^{\ 2} + (n_2 - 1)s_2^{\ 2}}{n_1 + n_2 - 2} \cdot \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Where: t – computed t-value

$\overline{x_1}$ - first sample mean

$\overline{x_2}$ - second sample mean

n_1 - number of respondents on the first sample

n_2 - number of respondents on the second sample

s_1 - standard deviation of the first sample

s_2 - standard deviation of the second sample

Degree of freedom

$$n_1 + n_2 - 2$$

Critical value at α 0.05 level of significant (df = 90) = 1.645

Appendix G
Lesson Plan (Group Guided Activity)

I. Topic: Circles

References: Lesson Guides in Geometry by Ateneo De Manila University pp. 82-83.

Materials: manila paper, Xerox copy of the activities

Time: 3 Days

II. Objectives: At the end of the sessions, at least 100% of the students with at least 100 % proficiency must be able to :

a. recall the definition of the following: circle, circumference, radius, chord, and diameter
b. determine the relationship between the radius and diameter of a circle.
c. differentiate points in the interior of the circle from points in the exterior of the circle
d. solve problems involving basic ideas related to circles.

III. Procedures

a. Preparation

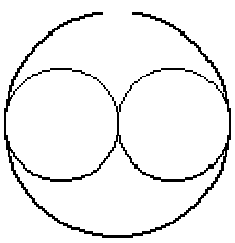
Ask the students to cite example of things that can be seen inside the classroom that are circular in shape. Ask the students what they think would happen if the wheels of the vehicles were oblong or square?.

b. Activity proper

Activity 1

1. Which figures is a circle? Why?
2. Draw a point on the center of the figure you think a circle and observe the distance of that point around the figure. What do you observe?
3. What is a circle?

Activity 2



1. Draw a radius and diameter in a circle. What is the measure of the radius of each circle?
2. What is the measure of the diameter of the big circle?
3. How does the radius of the two smaller circle related to the diameter of the big circle?

4. How does the radius of the big circles related to the radius of the other circles in the pictures?

Activity 3

1. Using tape measure, what is the measure of the objects on its edge(distance around its circular part or the circumference) and its diameter? Complete the table below.

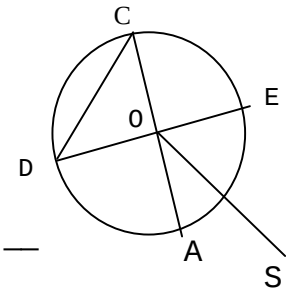
Object	Diameter	Circumference	Circumference/Diameter
Coin			
bottle			
Glass			

2. What do you observe about the relationship of the circumference and diameter?

c. Fixing skills

Identify the following in the figure.

1. center
2. Radii
3. diameters
4. chord
5. point in the interior of a circle
6. point in the exterior of the circle
   B
7. If AC= 8. 75 cm. how long is OD? OB? $\overline{OC}$?



d. Abstraction

Ask the following questions to students

1. How are circle named?
2. What relationship exists between the radius and the diameter of the circle?

3. When is point in the interior of the circle? In the exterior of the circle? Why?
4. When are two circles congruent?

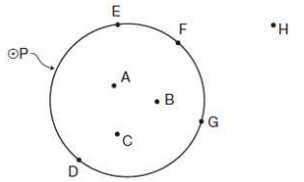
e. Evaluation

For 1-5: Indicate whether each statement is true or false

1. All radii of a circle is congruent
2. A radius is a chord of a circle
3. Every chord of a circle contains two points of the circle
4. A chord is not a diameter
5. All radii have the same measure.

For 6-10.:Give the correct answer.

6. What is the diameter of a circle whose radius is.
   a. 6cm ? b. 8.5 cm?
7. What is the radius of the circle whose diameter is
   a.15 cm b. 47 cm?
8. Which point(s) is an exterior point?
   a. A, B, C
   b. D, E, F, G
   c. H
   d. A, E, G, H



9. What is the circumference of the figure above if segment PD is 5 cm?
10. If the circumference of a circle is 192π feet, then the length of the circle's radius is

Lesson Plan in Geometry

I. Topic: Arcs and Angles
References: Lesson Guides in Geometry by Ateneo De Manila University pp. 83-84.
Materials: manila paper, Xerox copy of the activities
Time: 3 Days

II. Objectives: At the end of the sessions, at least 100% of the students with at least 100% proficiency must be able to :

a. Describe and illustrate a semicircle, minor arc and major arc
b. Define and identify a central angle and inscribe angle
c. Find the relationship between the measures of the central angle to its intercepted arc and inscribe angle to its intercepted arc.
d. Determine the degree measure of an arc of a circle
e. State and apply the postulate of arc addition determine the relationship between the radius and diameter of a circle.

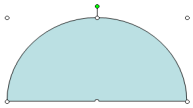
III. Procedures

a. Preparation

Show pictures of arch bridge. Ask students why bridge is made in arc shape?

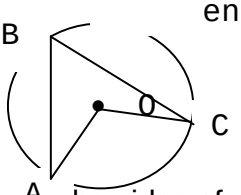
b. Presentation

Activity 1



1. Which figure shows a semi circle?
2. What kind of line joins the endpoints of the semi circle?
3. Do you see an angle form by the diameter? If there is an angle what is the measure?
4. If the angle determine by a diameter is the measure of the semi circle, what is a semi circle?
   It is a curve segment joining the two endpoints of the angle that

Activity 2



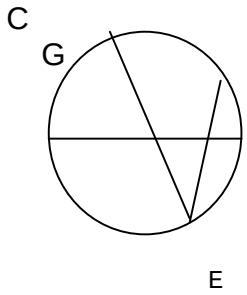
1. What he sides of ∠ABC? How do you call the sides?
2. What are the sides of ∠AOC? How do you call the sides?
3. Using the protractor, what is the measure of ∠AOC and ∠ ABC?
4. What do you observe about the measure of the two angles?
5. ∠ABC is an inscribe angle, what is an inscribe angle?

6. ∠AOC is a central angle, what is a central angle?

c. Fixing skills

Identify the following in the figure.

1.minor arc
2.semicircle
3.major arc
4.central angle
5.Inscribed angle



6. If arc DC= 80^0, what is the m ∠ DOC? Arc CF? ∠ COF?
7. If arc m ∠ CEG= 40^0 what is arc CG?

d. Abstraction

Ask the following questions to students

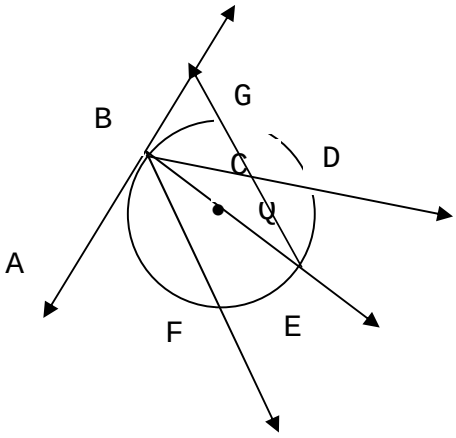
1. How is the relationship of central angles and its arc related?
2. What is the measure an inscribe angle that intercepts a semicircle?
3. Can an inscribe angle be an obtuse angle?
4. Is an inscribed angle which intercepts a major arc an obtuse angle?
5. What can you say about two inscribed angles which intercept the same arc?

e. Evaluation

Answer the following;

Given the figure with AB tangent to circle Q at B. If measure of arc EF = 72, measure of arc DE =64 and measure of arc DG =40. Find:

a. m∠DCE
b. m∠EBF
c. m∠DBE
d. m∠BFE
e. measure of arc BF
f. m∠ABF



Lesson Plan in Geometry

I. Topic: Angles formed by two intersecting chords but not on the center

References: Math Focus III by Ernesto C. Pagjunasan pp. 158.

Textbook in Geometry by S.J. Jose-Dilao and J. G Bernabe pp. 202-206

Materials: Manila Paper, zerox copy of the activities

Time: 2 Days

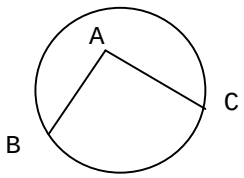
II. Objectives: At the end of the sessions, at least 100% of the students with at least 100 % proficiency must be able to :

a. Describe the angle formed by two intersecting chords not at the center.
b. State the relationship of the angle and its intercepted arcs.
c. Use the Intersecting – Chords Angle Theorem to solve problems

III. Procedures

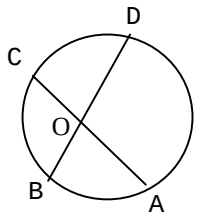
a. Preparation

Recall the measure of central angle and inscribe angle. Show the figure below and ask if arc BC = 100^0 what is the measure of the intercepted angle?



b. Activity proper

Activity



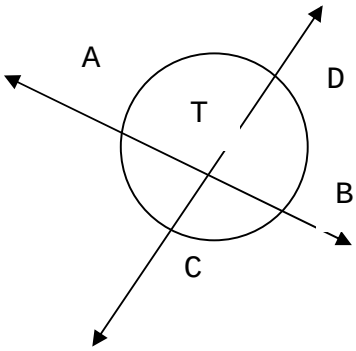
1. What is the angle intercepted to arc CD?
2. What is the angle intercepted to arc BA?
3. What is the relationship of the two angles intercepted by arc CD and arc AB?
4. Draw and measure an imaginary inscribe angle for arc CD and arc BA?
5. What is the measure of the following?

Arc CD	Arc BA	Sum of the two arcs	∠ COD

6. What do you conclude about the angle and its intercepted arcs?

c. Fixing skills

Consider each number separately.



1. If measure of arc = 40^0 and measure of arc BD = 80^0, Find m∠ATC
2. If m∠BTC = 130^0 and measure of arc AD = 160^0
3. If measure of arc AD = 150^0 and measure of arc BC = 110^0, find m∠ATD.
4. If measure of arc CAB = 270^0 and measure of arc AD = 140^0, find m∠BTD
5. If measure of arc ADB = 210^0 and measure of arc AC = 50^0, find m∠ATD
6. If measure of arc ABD = 250^0 and measure of arc CAD = 165^0 and measure of arc ADB = 195^0 , find m∠BTC

d. Abstraction

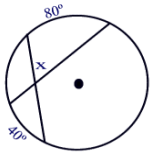
Ask the question to students

How is the relationship of the interior angles and its arc related?

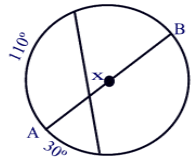
e. Evaluation

Answer the following

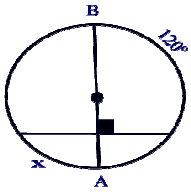
1. Given two intersecting chords,



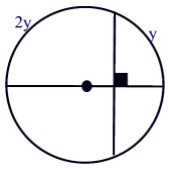
2. Given diameter $\overline{AB}$ and chord,



3. Given diameter $\overline{AB}$ perpendicular to a chord, find x.



For number 4 and 5 refer on the figure below



Given a diameter perpendicular to a chord,

4. Find y.
5. Find $2y$.

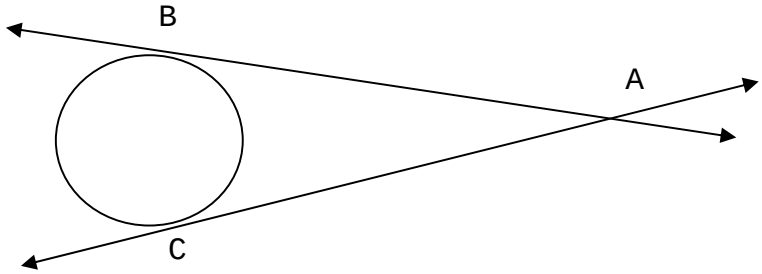
Lesson Plan in Geometry

I. Topic: Angles Formed by Secants and Tangents
References: Lesson Guides in Geometry by Ateneo De Manila University pp. 83-84.
Exploring Mathematics Geometry by O. A. Oronce and M. O. Mendoza pp. 502
Materials: manila paper, Xerox copy of the activities
Time: 3 Days

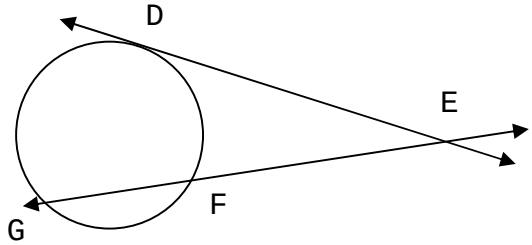
II. Objectives: At the end of the sessions, at least 100% of the students with at least 100 % proficiency must be able to :
   a. Describe the angle formed by two intersecting secants, two intersecting tangents and a tangent intersect by a secant.
   b. State and apply the relationship of the angle formed by two intersecting secants, two intersecting tangent and a tangent intersect by a secant and its intercepted arcs.

III. Procedures
   a. Preparation
      Review about inscribed angle and its intercepted arc.
   b. Presentation
   Each group will answer one item below.

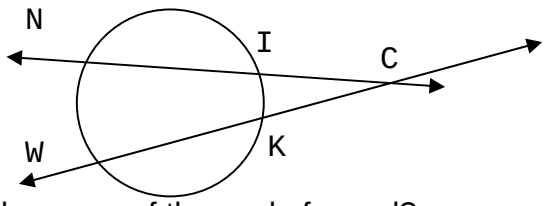
i.



ii.



iii.



Questions
1. What is the name of the angle formed?

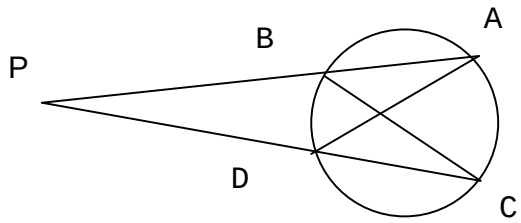
2. Where is the vertex of the angle?
3. What part of the circle are the sides of the angle?
4. What are the intercepted arcs of the angle?
5. Draw an inscribe angle to each intercepted arc?
6. Using the protractor answer the table.

Measure of the intercepted arcs	Difference of the measure of the intercepted arcs	Difference of the measure of the intercepted arcs /2	Measure of the angle
1. 2.			

7. What do you observe about the measure of the intercepted arcs and the measure of the angle? The measure of an angle formed by _____ through a circle is _____.

c. Fixing skills.

Consider the figure below.PA and PC are secants of the circle. If m of arc BD =25^0 and m$\angle$BOD= 40^0, find:



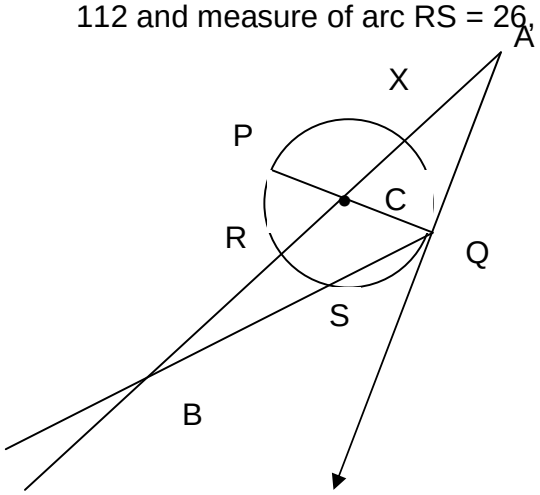
1. measure of arc AC
2. m$\angle$ADC
3. m$\angle$ABC
4. m$\angle$BCD
5. m$\angle$P

d. Abstraction

What is the relationship of the intercepted arcs to the angle form by two intersecting secants, two intersecting tangents, and tangent intersect by a secant?

e. Evaluation

Give circle C with AQ tangent to the circle at Q, If measure of arc PX = 112 and measure of arc RS = 26, find



1. measure of arc PQX
2. measure of arc XQ
3. m$\angle$QBA
4. m$\angle$XCQ
5. m$\angle$PCR
6. measure of arc RP
7. measure of arc SQ
8. m$\angle$QAB
9. measure of arc PS
10. m$\angle$PQS

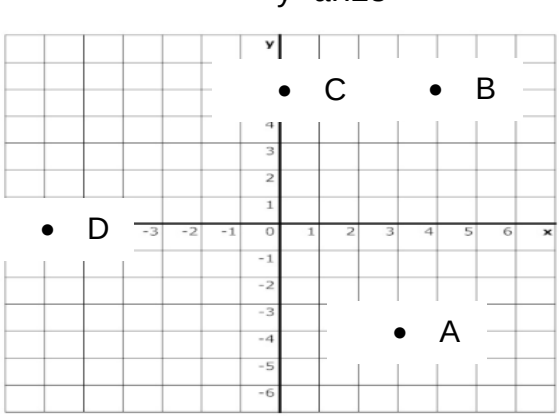
Lesson Plan in Geometry

I. Topic: Review of the Cartesian Coordinate Plane
References: Lesson Guides in Geometry by Ateneo De Manila University pp. 90-91.
Materials: manila paper, Xerox copy of the activities
Time: 2 days

II. Objectives: At the end of the sessions, at least 100% of the students with at least 100 % proficiency must be able to;
a. Name and describe the parts of the Cartesian plane
b. Find the coordinates of points plotted on the Cartesian plane
c. Graphs points on the Cartesian plane given.

III. Procedures
f. Preparation
Ask the students about Rene Descartes and his contribution.
g. Presentation
Activity 1
1. Draw two perpendicular number lines intersecting at zero, how many regions were forms?
2. How do you call the point of intersection?
3. How do you call the vertical number line?
4. How do you call the horizontal number line?
5. What direction is positive?
6. What direction is Negative?

Activity 2



1. The point A(3,-4) is in fourth quadrant. How do you call 3 ? -4?
2. The point B (4,5) is in first quadrant, how do you call 4? 5?
3. The point C(0,5) is in y- axis, how do you call 0? 2?
4. The point D(- 6,0) is in x- axis, how do you call -6? 0?

5. What do you observe about the order of the number in a given point?

c. Fixing Skills

Directions: Plot the following points on the Cartesian plane

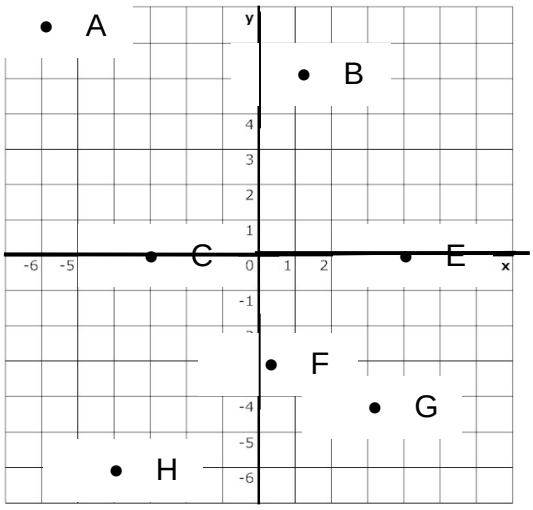
1. A(3,6)
2. B(-2,-5)
3. C(1,0)
4. D(-7/3,-7/2)
5. If points A(-3,-3) , B(O,-3) and C(0,0) are vertices of quadrilateral, then what are the coordinates of point D such that ABCD is a square?

d. Abstraction

What is a Cartesian plane?
What are the parts of a Cartesian plane?
How to plot a point in the Cartesian plane?

e. Evaluation

Answer the following.
(For numbers 1 to 6 refer to the Cartesian plane)



1. Which point lies on the fourth quadrant?
2. What is the abscissa of point A?
3. What axis contains point C?
4. What points do not lie on any of the quadrants?
5. What points has abscissa and ordinate which is additive inverse of each other?
6. What points have the same abscissa?
7. How do you describe the abscissas of all
8. the points lying on a vertical line?
9. If the abscissa and the ordinate of a point have the same signs, then in what quadrants/s can it lie?
10. If the abscissa of a point is positive and its ordinate can be a

Lesson Plan in Geometry

I. Topic: Slope of a Line
References: Lesson Guides in Geometry by Ateneo Manila University pp. 82-83.
Materials: manila paper, Xerox copy of the activities
Time: 2 Days

II. Objectives: At the end of the sessions, at least 100% of the students with at least 100 % proficiency must be able to define and determine the slope of a line.

III. Procedures

a. Preparation
Review on plotting points.
Ask the students about the tallest mountain in Philippines and then ask how it feels to climb mountains.

b. Presentation

Each group will answer one item

i.

X	-1	0	1	2	3
Y	-6	-4	-2	0	2

ii.

X	-3	-1	0	2	3
Y	3	3	3	3	3

iii.

X	1	1	1	1	1
Y	-6	-4	0	4	6

iv.

X	-2	0	1	2	3
Y	5	1	-2	-5	-6

Questions;
1. Plot and connect each point. What is form?
2. Consider two points, what are the x- coordinates? y- coordinates?
3. How many units is the change in x? change in y?

4. What is the ratio of the change in the x-coordinate and y-coordinate?
5. Consider again another two points, what are the x- coordinates? y-coordinates?
6. How many units is the change in x? change in y?
7. What is the ratio of the change in the x-coordinate and y-coordinate?
8. What kind of line is form?

c. Fixing skills

Find the slope of the line passing through the given points.

1. (5,1) and (1,8)
2. (-4,-1) and (1,8)
3. (-2,-1) and (-4,-7)
4. (1/2,1/5) and (1/2 , 3/5)
5. (0,a) and (b,0)

d. Abstraction

What is slope?
How to find the slope of a line?
When is the slope of a line zero? Positive? Negative? Undefined?

e. Evaluation

Answer the following.
For 1-3, refer on the given below

Given: A(-3,2), B(1,4),C(5,5), and D(9,7)

1. $\overline{AB}$
2. $\overline{CD}$
3. $\overline{AD}$

For 4-5, use the formula of slope to find the missing coordinate.

4. The points(2,4) and (5,_) lie on a line whose slope is 7/3.
5. The points (_,3) and (-2,-5) lie on a line whose slope is 4.

Lesson Plan in Geometry

I. Equation of line
References: Lesson Guides in Geometry by Ateneo De Manila University pp. 95-96.
Materials: manila paper, Xerox copy of the activities
Time: 3 Days

II. Objectives: At the end of the sessions, at least 100% of the students with at least 100 % proficiency must be able to;
a. Identify a linear equation y= mx + b or ax + by = c
b. Draw the graph of a linear equation.
c.. Determine the equation of a given line

.

III. Procedures
a. Preparation
Review on slope of a line.
b. Presentation/ Activity
Activity 1
1. Given the equation x + 2y = 6 and values of x, what is the value of y?

X	2	0	-2	4
Y				

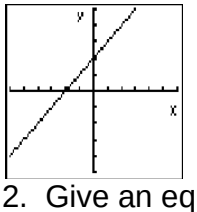
2. What is the graph of the equation?
3. What is the slope?
4. At what point the line intersect the y- axis?

Activity 2
1.Given the equation y = ½ x + 3 and values of x, what is the value of y?

X	2	0	-2	4
Y				

2. What is the graph of the equation?
3. What is the slope?
4. At what point the line intersect the y- axis?
5. What is the relationship of the equation to its graph particularly the slope and the point of intersection at y –axis?

c. Fixing skills
Find the equation of this line.
1.



2. Give an equation of the line with slope of 7 and y-intercept 6.
3. Give an equation of the line with slope of 7/8 and y-intercept -1/4.

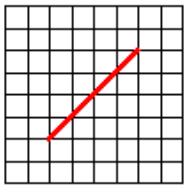
d. Abstraction

What are the two forms of linear equation?
What is the graph of a linear equation?
Given an equation in the form y = mx + b, what is m? and b?

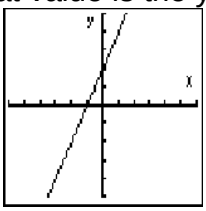
e. Evaluation

Answer the following.

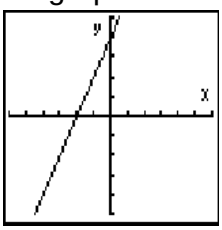
1. Find the gradient (slope) of this line.

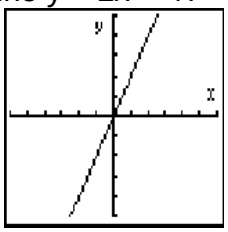


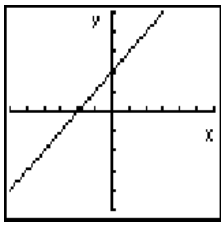
2. What value is the y intercept of this line?



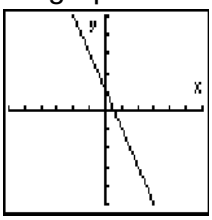
3. Which graph shows the line y = 2x + 4?

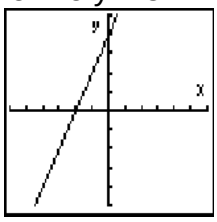
a. 

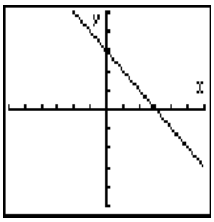
b. 

c. 

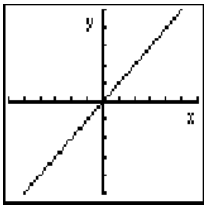
4. Which graph shows the line y = 3 – x?

a. 

b. 

c. 

5. Find the equation of this line.



Lesson Plan in Geometry

I. Topic: Slope of Parallel lines and Perpendicular lines
References: Lesson Guides in Geometry by Ateneo De Manila University pp. 82-83.
Materials: Manila Paper, xerox copy of the activities

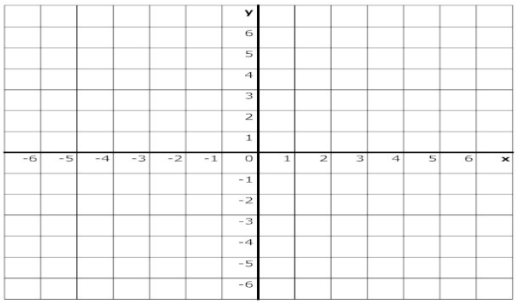
Time: 3 Days

II. Objectives: At the end of the sessions, at least 100% of the students with at least 100 % proficiency must be able to state and apply the definition of parallel and perpendicular lines.

III. Procedures

a. Preparation
Review slope of a line.
Write the following equation the form y= mx+b
1. 2x+y= 4
2. x + y = 4
3. 3y – 6 = x
4. 3x + 5 =y
5. 3x+ 2y = 10

b. Presentation



Each group will answer one item below.

i.
y = -2/5 x -2
5x - 2y = 10

ii.
x + 4 = y
y – x = 3

iii.
x + y = 6
4y -4x = 12

iv.
8x – 4y = 16
5y – 10x = 3

Questions.

1. Write the equation in the form y=mx+b.
2. What is the slope and the y-intercept of each equation?
3. Using the slope and the y-intercept, what is the graph of the two equations (use only one Cartesian plane)?
4. What do you observe about the graphs of the two equations?

c. Fixing skills

Answer the following.
Determine if the following two lines are parallel or perpendicular based on their equations.

1. y + 5 = 6x
   -6x – y = 7
2. y = -2/3 x + 6
   3x + 2y = 14

d. Abstraction

When are two lines parallel? Perpendicular?

e. Evaluation

Complete to make a true statement.

1. Any two horizontal lines are _____ to each other.
2. The negative reciprocal of -1/3 is _____.
3. If the slope of ST is undefined and the slope of XR is 0, then ST____XR.
4. Line MN has slope 7. Any line perpendicular to MN has slope _____. Any line parallel to MN has slope_____.
5. Two lines have equations y=3/4x-3 and y= -4/3 x -3, respectively. These two lines are _____ and intersect at the point with coordinates_____.
6. The negative reciprocal of -2 is_____.
7. Any two vertical lines are _____ to each other.
8. Two lines have equations y = 3x + ½ and y- 3x-5, respectively. These two lines are _____ an their intersection is a/ an_____.

Lesson Plan in Geometry

I. **Topic**: Distance Formula

References: Lesson Guides in Geometry by Ateneo De Manila University pp. 100-101
Textbook in Geometry by S.J. Jose-Dilao and J. G Bernabe pp. 237-240

Materials: manila paper, Xerox copy of the activities

Time: 3 Days

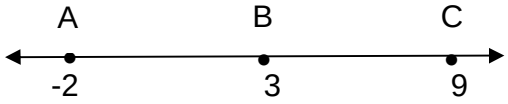
II. **Objectives**: At the end of the sessions, at least 100% of the students with at least 100 % proficiency must be able to :

a. Find the distance between two points lying on the same horizontal or vertical line.
b. Derive the Distance Formula using the Pythagorean theorem.
c .Use the Distance Formula to determine the distance between two points.

III. **Procedures**

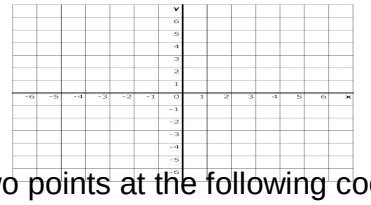
a. Preparation/ Review

Present a number line such as the one shown below



Then ask the students to find the following distance: $\overline{AB}$, BC, $\overline{and}$ AC. They Should find it easy to give you 5, 6 and 11 respectively. State that in general if a and b are coordinates of points A and B respectively, then the distance between A and B is AB= /a-b/. This is a good opportunity the concept of absolute value. Provide another example using vertical number line. Then give example where two points are not on one horizontal line or vertical line such as the following A(-2,1) and B (1,5). Ask the students how to find the distance of segment AB.

b. Presentation/ Activity proper



1) Draw two points at the following coordinates: Point A: (-2, 1) and Point B: (1,5). Guess approximately the distance between the two points.

2) Draw Point C at (1,1). What kind of shape can be made by connecting points A, B, C?

3) What kind of triangle is made by points A, B, C?

4) How can you find the length of segments AC and BC? In this triangle, what is segment AB called?

5) Knowing $\overline{AC}$ and $\overline{BC}$, what theorem can we use to solve for $\overline{AB}$?

6) Rewrite the theorem so that the distance between Points A and B is on one side of the equation by itself.

7) Congratulations, you have worked out the distance formula. Now solve for the distance between points A and B.

c. Fixing skills

Using the formula find the distance of the following:

1. A(-4,7) and B(6,-2)
2. C(0,6) and D (-2,-2)
3. E (-8,1) and F(4,-1)

d. Abstraction

\

Ask the question to students

What is the use of distance formula??

e. Evaluation

Find the distance between the given points,

1. (-3,7), (5,-4)
2. (-6,0),(4,5)
3. (-2,-5),(5,3)
4. (0,7),(-1,-7)
5. Show that the triangle with vertices D(-2,2), E(-2,-2), and F(1,-2) is a right triangle.

IV. Assignment

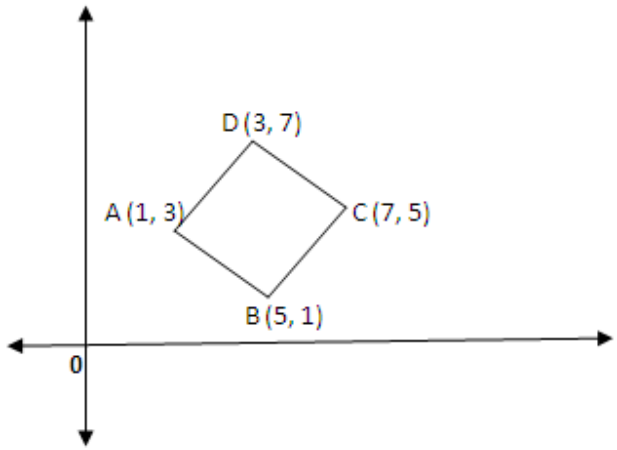
Refer to textbook on Geometry by S.J. Jose-Dilao and J. G Bernabe pp. 239, test yourself item # 6-10

Appendix I
Lesson Plan(Traditional Approach)

I. TOPIC: Distance Formula
References: Lesson Guides in Geometry by Ateneo De Manila University pp. 100-101
Textbook in Geometry by S.J. Jose-Dilao and J. G Bernabe pp. 237-240
Materials: Manila Paper
Time frame: 3 sessions

II. OBJECTIVES:
At the end of the sessions, the students must be able to:
1. State and apply the definitions of parallel and perpendicular lines.
2. Solve problems using the definitions of parallel and perpendicular lines.

III. PROCEDURES
DEVELOPMENT OF THE LESSON:
A. At the start of the lesson use a prepared diagram and ask the students to use the diagram to answer the questions that follow.



1. Give the slopes of sides AB and $\overline{CD}$.
(The slopes of the sides AB and $\overline{CD}$ are both -½).
2. Give the slopes of sides BC and $\overline{DA}$.
(The slopes of sides BC and $\overline{DA}$ are both 2.)
3. Give the slopes of sides AB and $\overline{BC}$.
(The slopes of sides AB and $\overline{BC}$ are – ½ and 2).

4. Give other slopes of sides DC and AD.
   (The slopes of sides DC and AD are -½and 2).

B. By using a protractor and ruler, help the students to see that the figure is actually square. Then use their answer to the questions given earlier as well as all that they have learned about a square in previous lessons to lead to the following generalization:

1. Two lines are parallel if and only if they have equal slopes.
2. Two lines are perpendicular if and only if the product of their slopes is -1.

Explain the statement on parallel lines in greater detail. Emphasize that the statement is stating two points:

1. If two lines are parallel, then they have equal slopes. Show an example. Then ask the students to do the following problems. The solution is also given below.
   Example: Write an equation of the line parallel to y = 3x – 1 and passing through the point (2, -5).

Solution: The slope of the given line is

2. Therefore the slope of a line parallel to the given line is also 3. The slope-intercept equation of a line with slope 3 is y = 3x + b. The coordinate of the point (2, -5) must satisfy the equation

$$-5 = 3(2) + b$$
$$-5 = 6 + b$$
$$b = -11$$

Answer: The required line is y = 3x – 11.

3. If two lines have equal slopes, then they are parallel. Go through an example. Then ask the students to identify the lines which are parallel given their slopes.

C. Explain the statement on perpendicular lines in greater detail.

1. If two lines are perpendicular, then the product of their slopes is -1. Go through some example with the students to explain further what this statement means.
   As a further example, present the following problem and guide the students in working out the problem:
   Example: Write an equation of the line through (-4, 3) that is perpendicular to the line
   2x – y + 3 = 0.
   Solution: Write the equation of the given slope-intercept form.

$$2x – y + 3 = 0$$
$$y = 2x + 3$$

   The slope of a given line is 2.

Therefore, the slope of any perpendicular line is -½. The slope-intercept equation of a line with slope -½ is y = -½x + b

The coordinates of the point (-4, 3) must satisfy the equation.

$3 = -\frac{1}{2}(-4) + b;\ b = 1$

Answer:
The required line is $y = -\frac{1}{2}x + 1$.

D. After summarizing the important statements on parallel and perpendicular lines at the end of the lesson, ask the students to work on some exercises to work on.

Problem Solving:

1. (2, 7), (-2, -1), (6, 5) are vertices of a triangle. Is this a right triangle?
2. Recall that the diagonals of a rhombus are perpendicular. Show that the points (-2, 1), (3, 3), (5, 0), and (-1, -2) are not the vertices of a rhombus.
3. If line DE id perpendicular to line EF in each case, find the value of k.
   a. D (1, -1), E (3, 1); F (2, k)
   b. D (-3, -1); E (3, 3); F (k, 6)
4. Show by means of slopes that the points (-4,-1), (3, 8/3), (8, 4) and (2, -9) are the vertices of a trapezoid. Recall that a trapezoid is a quadrilateral with exactly one pair of opposite sides parallel.

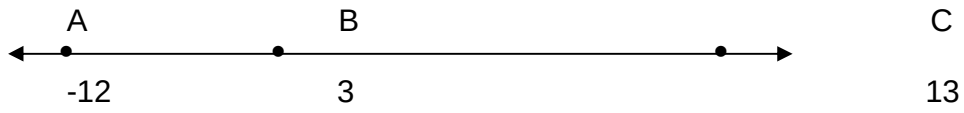
LESSON PLAN IN GEOMETRY

I. TOPIC: Distance Formula
References: Lesson Guides in Geometry by Ateneo De Manila University pp. 82-83.

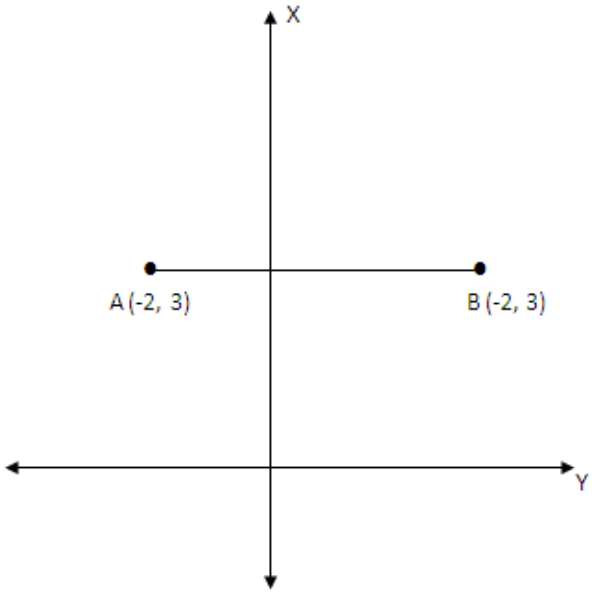
Materials: Manila Paper
Time frame: 3 sessions

II. OBJECTIVES:
At the end of the sessions, the students must be able to:
1. Find the distance between two points lying on the same horizontal or vertical line.
2. Derive the Distance Formula using the Pythagorean Theorem.
3. Use the Distance Formula to determine the distance between any two points.

III. PROCEDURES
DEVELOPMENT OF THE LESSON:
A. Present a number line such as the one shown below:



Then ask the students to find the following distance: AB, BC, and AC. They should find it easy to give you 15, 10 and 25 respectively. State that general, if a and b are the coordinate of points A and B, respectively, then the distance between A and B is AB = |a - b|. This may be a good $_2$opportunity to review the concept of absolute value.
Show , therefore, that if on the Cartesian plane two points A and B lie on a line parallel to the x-axis, then distance AB =$|x_2 – x_2|$= $|x_2 – x_2|$ where x_1 and x are the x-coordinates of the points A and B, respectively.

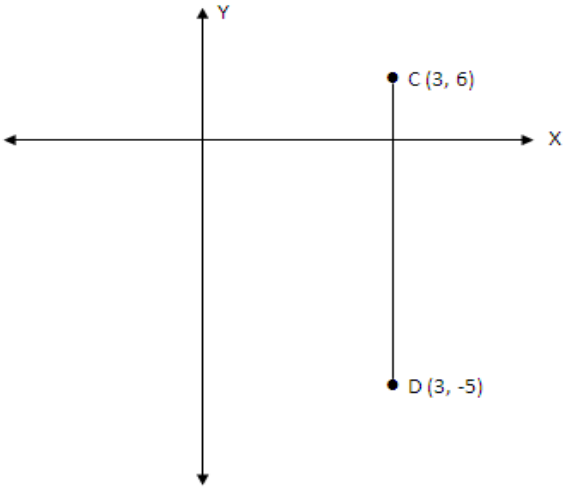


$AB = |X_2 - X_1|$

$AB = |5 - (-2)| = |5 + 2| = 7$

Similarity if two points C and D lie on a line parallel to the y-axis, then distance $CD = |y_2 - y_1| = |y_1 - y_2|$ where y_1 and y_2 are the coordinates of the points C and D.

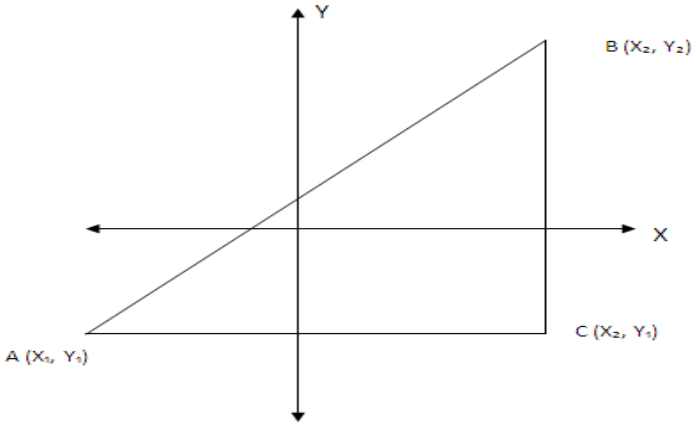
y-



B. Then give an example where two points are not on one horizontal line or vertical line such as the following:
Find the distance between A (-4, 7) and B (6, -2).
Clearly, the procedures used in part A are not applicable.

C. Draw a diagram indicating two points, in general, A (x_1, y_1) and B (x_2, y_2).
The required distance is AB.

Tell the class that to find distance AB, it may be helpful to form a right triangle, ΔABC, where AC is parallel to the x-axis and BC is parallel to the y-axis. This is shown below.



Ask the students to recall a formula they have learned which involve the length of AB. A little hint should help them recall the Pythagorean Theorem, a theorem which can give the length of AB based on the lengths of AC and BC. The students should be able to state that in a right triangle, where a and b are the lengths of the legs and c is the length of the hypotenuse, we have,

$a^2 + b^2 = c^2$

Then illustrate how this may be used to derive a formula for the length of AB:

$AB = \sqrt{(6 - (-4)^2 + (-2, -7)^2}$
$= \sqrt{(6 + 4)^2 + (-2 - 7)^2}$
$= \sqrt{(10^2 + 9^2)}$
$= \sqrt{100 + 81}$
$= \sqrt{181}$

The distance between A and B is $\sqrt{181}$ units.

LESSON PLAN IN GEOMETRY

I. TOPIC: Arcs and Angles

References: Lesson Guides in Geometry by Ateneo De Manila University pp. 83-84.

Materials: Manila Paper

Time frame: 3 sessions

IV. OBJECTIVES:

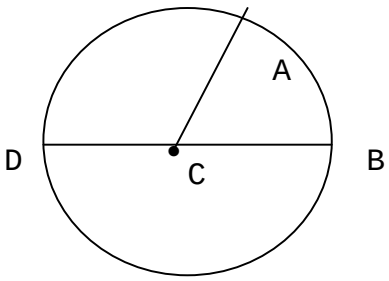
At the end of the sessions, the students must be able to:

1. Describe and illustrate a semicircle, minor arc and major arc.
2. Define and identify a central angle.
3. Find the relationship between the measures of the central angle and its intercepted arc.
4. Determine the degree measure of an arc of a circle.
5. State and apply the postulate on Arc Addition.

V. PROCEDURES

DEVELOPMENT OF THE LESSON:

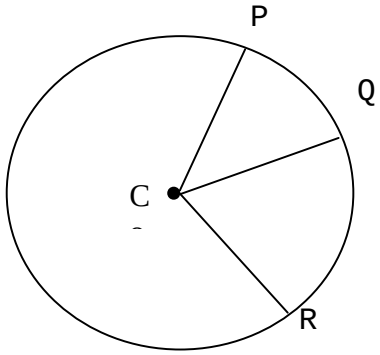
A. Define a central angle. Illustrate what a central angle is given the circle with C as the center of the circle.Identify a minor arc, major arc, and a semicircle in the figure. Emphasize proper notation: minor arc, AB major arc ADB, semicircle DAB. If possible, use three letters to avoid confusion



B. State that arcs are measured in degrees (in geometry). Define the measure of an arc. The measure of a minor arc is the measure of the corresponding central angle. In the figure, m AB = m <ACB. The measure of a major arc is 360 – measure of the corresponding minor arc. The measure of a semicircle is 180^0. The notation for measure of an AB is mAB.

C. Explain that arc measurements can also be added. Emphasize that only measurements are added and not the arcs. Emphasize correct notation.

$\overset{\frown}{mPQ} + \overset{\frown}{mQR} = \overset{\frown}{mPQR}$



D. Go over some examples.
E. Let the students do some exercise as seatwork.

Appendix I
Validity of the Activity

Topics	Comments	Action Taken
Circle	Changed the grammar on activity number two of questions number 3 and 4 Revised activity number 3	Changed the word "does" to "do" and "two smaller circle" to "two smaller circles". Change activity 3
Arcs and angles	Activity number 1 is confusing. Changed questions 1 and 2 of activity number 1.	Revised activity 1. Provided non example and example of semicircle. Changed from question "How do you call the sides of the angle?" to "What part of the circle are the sides of the angle?"
Review of Cartesian coordinate plane	Revised questions 3 and 4 of activity one.	Changed from "how do you call the vertical line? horizontal line? " to "what kind of line is y-axis? x-axis?
Slope of a line	Revised question 3.	Change question from "how many units is the change in x? change in y?" to "how many units are the change between the x coordinates? y-coordinates?"
Parallel and Perpendicular lines	Examples presented on the activity are not enough	Provided examples of 2 equations for parallel lines and examples of 2 equations for perpendicular lines
Distance Formula	Removed the article "a" before the word two points of questions number 1. In question number 3 changed lengths to length.	Removed article "a" and changed lengths to length.

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Champion in the Search for the Best demonstration Teacher of District 1 Valenzuela City for Second Year Level on November, 2010

REFERENCES

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