

The Implementation of Blended Learning Approach through Self-learning Modules and Technology-based Platforms in Precalculus Class

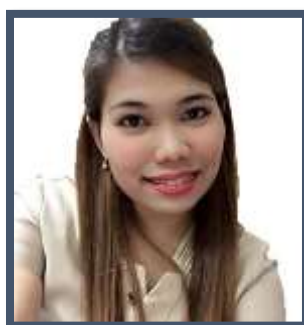
An Action Research Presented to the
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MMN

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ABSTRACT

The purpose of this action research was to determine and analyse the effects of blended learning on the learning development and academic performance of Grade 12 students in Precalculus. The study hypothesized that there is no significant difference in the level of learning development and in the level of performance between the two groups of Grade 12 students in Precalculus. A mixed-method research design was employed in this action research in which both qualitative and quantitative methods were applied to gain better analysis on the effects of blended learning and understand more its benefit to the improvement of Grade 12 students.

This study was participated by a total of eighty (80) Grade 12 students from two sections in the said grade level. One group (named as Group 1) consisted of forty-seven (47) students used only Self-Learning Modules (SLMs) for learning the most essential learning competencies (MELCs) in the first quarter of Precalculus subject, while the second group (named as Group 2) consisted of thirty-three (33) students were exposed to blended learning modality with the use of both SLMs and online learning in acquiring the first quarter MELCs in Precalculus. Purposive and cluster sampling techniques were employed to select the participants.

Pre-test and post-test and quarterly academic grade in Precalculus were used for quantitative sources of data while semi-structured interview, students' reflection/journal, focus group discussion, and teacher-researcher observations were utilized to collect qualitative data.

The teacher-researcher prepared fifty-item multiple choice test questions measuring the first quarter most essential learning competencies in Precalculus. They were statistically analyzed using frequency count, percentage, mean, standard deviation, mastery level computation, t-tests. The qualitative data underwent coding and thematic analysis. All the responses in the interview, focus group discussion, and students' journal were transcribed, coded, and analyze narratively for the presentation of the result.

The findings indicated that both groups improved, yet Group 2 improved better than Group 1. Group 2 who were exposed to blended learning performed better than Group 1 who were exposed to Self-learning Modules only based on their first quarter academic mean grade. The level of learning development and level of performance of the two groups significantly differ as

measured by their post-test and first quarter academic grades. The conclusions, recommendations and reflections on the results were discussed in the study.

Keywords: blended learning, Self-Learning Modules, Grade 12 students, Precalculus

CONTEXT AND RATIONALE

Due to COVID-19 crisis which makes face-to-face classes too risky, education is indeed at great stake. But still, education must continue as the Education Secretary Leonor Briones stated. Yet, providing learning opportunities to students without requiring them to come to school is a challenge for the entire member of the Department of Education, especially to teachers, who is the front- liner of education.

Aside from the challenge to the teachers on the preparation, simulation, and implementation of continuing teaching and learning process during this time of pandemic, students' situation is another problem to be considered. Some students may both lack of gadget and access to the internet, while some may have gadget but do not have enough internet connection. Such problems should be addressed and needed an action.

Also, in response to Department of Education Order No. 12 s. 2020 on the Adoption of the Basic Education Learning Continuity Plan for School Year 2020-2021 in light of the COVID-19 Public Health Emergency, stating that the Most Essential Learning Competencies (MELCs) shall be delivered in multiple learning modalities and platforms, which has been the legal basis to conduct this study.

Since the SDO Navotas adopted Blended Learning Delivery Modality employing Modular Distance Learning and Online Distance Learning, the teacher-researcher is followed the combined learning modalities. SDO Navotas “NavoBox” for modular distance learning is thought to be not enough for the learning of the students and the presence of teacher is still needed in the light of teaching Precalculus.

Haygood & Bull (2012) conducted a study titled “Let’s Face It: Integrating Facebook in a Precalculus High School Course”, where they also examined the effects of blended learning in Precalculus class. The result revealed a positive outlook of the students on blended learning with greatest gain. The combination of traditional face-to-face and use of Facebook as educational tool was found effective in the study.

Using this study as basis, the researcher came up of utilizing blended learning approach in Precalculus instruction wherein this venture was called "LIFE BLAST" which means "Leading an Interactive, Fun & Engaging instruction in a Blended Learning Approach through Self-learning module and Technology-based platforms" on Precalculus class.

The teacher-researcher believed that the use of Self-learning module and online (technology-based) platforms should be found by the students interactive, fun and engaging where the teacher will still lead this kind of instruction. The researcher further believed that this would give an improved performance among Senior High School students, specifically, Grade 12 students taking Precalculus class. Hence, the purpose of this action research was to determine and analyze the effects of blended learning on the learning development and academic performance of Grade 12 students in Precalculus.

ACTION RESEARCH QUESTIONS

This study generally aimed to determine and analyze the effects of blended learning on the learning development and academic performance of Grade 12 students in Precalculus.

With this, it sought to answer the following specific questions:

1. What is the level of learning development of the two groups of respondents based on their pre-test/post-test scores?
2. What is the level of performance of the two groups of respondents as revealed by their quarterly academic grade in Precalculus?
3. Is there a significant difference in the level of learning development of the two groups as determined by their test scores in Precalculus?
4. Is there a significant difference in the level of performance of the two groups as determined by their academic grade in Precalculus?
5. How does the blended learning modality help improve the performance of Grade 12 students in Precalculus?
6. At the end of the quarter, what are the insights of the two groups of students about their chosen learning modality?

7. What output may be proposed based on the result of the study?

Hypothesis:

This action research hypothesized that there is no significant difference in the level of learning development and in the level of performance between the two groups of Grade 12 students in Precalculus.

INNOVATION, INTERVENTION OR STRATEGY

As endorsed by SDO Navotas on what learning delivery modality to be adopted and implemented in the division, thus, the researcher employed Blended Learning Delivery Modality. The intervention is a blended learning approach through employing both modular and online distance learning modalities. The teacher-researcher employed mixed learning modalities including Messenger, Microsoft Forms and EdPuzzle and modules.

Literature Overview

In the study of "Blended Learning Process in Education" Context by Khan, et.al (2012), they concluded that blended learning could support more flexible, interactive, accessible, and varied learning experience for students yet, its benefit lies on systematic adaptation of technology-aided methods along with other mode of learning appropriate to the learners.

In a research article by Kintu, Zhu & Kagambe (2017) entitled "Blended learning effectiveness: the relationship between student characteristics, design features and outcomes" underscored that blended learning entailed increasing students' level of constructing knowledge which create logical skills in them.

Ceylan & Kesici (2017) investigated the effects of blended learning on the high schools' academic achievement. The design used in the study was quantitative method wherein academic achievement test and product evaluation scale were used as data-gathering sources. The study revealed that blended learning environment had generated

a significant difference in students' academic achievement on behalf of experimental group.

Hesse's study (2017) titled "The effects of blended learning on K-12th grade students" conducted through literature review examined the effects of blended learning on student engagement, student achievement, and student perception in K-12th grade classrooms. Studies published between 2008 and 2016 were selected for peer-reviewed and analysis. The reviewed research indicated that when blended learning was used, the student engagement, student achievement, and positive student perceptions of learning increased. Students also developed additional skills with blended learning, such as the ability to self-pace and self-direct.

Oweis (2018) conducted a study with the aim of determining the effects of using blended learning method on students' achievement and motivation in learning English. The sample comprised 34 students who were selected purposefully and distributed into experimental and control groups. The experimental group studied English through a blended learning, whereas the control group was taught solely by the traditional method. The result revealed statistically significant differences in achievement between the two groups, which indicated that the experimental group performed better than the control group. Significant differences were also found in the respective groups' motivation to learn English.

Chaney (2016) studied the effect of blended learning on Math and reading achievement in a charter school context. The study compared the academic mean scored of students in a blended learning environment, students who received traditional classroom instruction, and students who used fully online learning. The study determined that there is no statistically significant relationship between traditional, blended, and fully online students in the math scores, nor between traditional and blended learning students in the reading scores. However, there was a statistically significant relationship between fully online students and higher reading scores.

Based on the above studies, the implementation of blended learning approach through online-based platform such as Messenger and EdPuzzle and others, along with self-learning modules can be an effective learning modality to increase the Grade 12 students' performance in Precalculus.

ACTION RESEARCH METHODS

This part presents the research design and the procedures undertaken in the conduct of this action research. It includes the research design, the participants of the study, the sampling technique used, the research instrument, the construction and validation of research instrument, the data gathering method, and the data analysis.

Research Design

A mixed-method research design was employed in this action research in which both qualitative and quantitative methods were applied to gain better analysis on the effects of blended learning and understand more its benefit to the improvement of Grade 12 students.

Moreover, since this study is an action research, it also followed and employed the four-step process of doing action research by Mertler (2014). These four-step process includes planning, developing, acting, and reflecting. The description of each step during the action research process was discussed in detailed in Action Research Process below.

Participants of the study

This action research was participated by a total of eighty (80) Grade 12 students from two sections in the said grade level. One group (named as Group 1) consisted of forty-seven (47) students used only Self-Learning Modules (SLMs) for learning the most essential learning competencies (MELCs) in the first quarter of Precalculus subject, while the second group (named as Group 2) consisted of thirty-three (33) students were exposed to blended learning modality with the use of both SLMs and online learning in acquiring the first quarter MELCs in Precalculus.

Purposive and cluster sampling techniques were employed to select the participants. Purposive sampling technique was used since the teacher-researcher was handling Grade 12 students in Precalculus. Then, cluster sampling technique was used

to select two sections in Grade 12 that participated in the study. Grade 12 students were clustered into sections with heterogenous class, that is why, it is more appropriate to use as sampling technique. After selecting two sections, students from those who were only using Self-Learning Modules were identified to be collected as one group, and students who were having blended learning (both SLMs and online) were gathered as another group.

Sources of Data

For quantitative data, the research instruments used were pre-test and post-test and quarterly academic grade in Precalculus. The pre-test/post-test was teacher-made and were checked and validated before the administration. This test was administered to the two groups of student-participants before and after the conduct of the study. The quarterly academic grades of the participants of the study were obtained with the permission of the school and department heads.

For the qualitative data, semi-structured interview, students' reflection/journal, focus group discussion, and teacher-researcher observations were utilized. A semi-structured interview guide questions were made by the teacher-researcher. Students' reflection/journal was one of the outputs required to the student-participants at the end of the quarter. Focus Group discussion with selected students who were active in respective groups was also conducted for the purpose of data triangulation. The teacher-researcher also wrote observation checklist about SLMs implementation and blended-learning execution.

Construction and Validation of Research Instrument

The pre-test and post-test were prepared by the teacher-researcher to determine the mean performance and mastery level of the student-participants in Precalculus. The teacher-researcher prepared fifty-item multiple choice test questions measuring the first quarter most essential learning competencies in Precalculus. To ensure the content validity, clarity, and appropriateness of the pre-test and post-test, item-questions were reviewed. Suggestions were received from three people who were experts in the field including the school head, department head, and master teacher in Mathematics of San

Roque National High School. Necessary adjustments were made in line with the feedbacks from the experts, and the draft test was administered to 15 Grade 12 students who were not part of the research for the purpose of reliability testing. Item analysis was then conducted, item discrimination and difficulty were checked, and the final test consisting of 50-item questions was formed by taking the test items that provided the best results among those measuring the same information. The final set of 50-item test was administered in the present study. Kuder-Richardson coefficient were calculated for reliability. The reliability coefficient of the final test was calculated as 0.880, that signified accepted test. The test was then applied to the two groups of Grade 12 students. The test was answered in 50 minutes. On the other hand, the semi-structured interview guide questions were also validated on content and construct by an English teacher in Senior High School.

Data Gathering Methods

Prior to the conduct of this action research, it was proposed to the Schools Division Office of Navotas. The action research proposal was checked and evaluated by the Schools Division Research Committee (SDRC). Then, it was returned to the researcher for revision based on the SDRC comments and suggestions. The revised and edited research paper was returned to SDO Navotas for re-checking. This action research passed in the evaluation of SDRC and was recommended for approval of the region. The region accepted and allowed the conduct of the research under the Basic Education Research Fund (BERF). Upon the approval of the SDO Navotas Research Committee and region NCR Research Committee, this action research started its implementation.

A letter of request to conduct the study in San Roque National High School was also submitted to the principal. After the approval, the student-participants were identified. Considering the ethical considerations in conducting the research, the parents of the student-participants were informed that their child will be part of the study through an online meeting for those who have gadget and internet access, while the parents of the participants who cannot join online were just informed during the distribution of SLMs and both were given letter of consent. Another meeting was conducted, this time, for student-participants to inform them about their participation in the study.

The data gathering procedure followed four phases. Phase 1 involved the administration of pre-test. Student-participants' scores were recorded and kept. Phase 2 encompassed the implementation and experimentation of blended learning modality for one group and SLMs only for another group. The experimentation of the study was completed for one quarter of the school year 2020-2021. At the middle date of the quarter, a focus group discussion was conducted to gather information from the students about the implementation of blended learning and the condition of students who were only using SLMs. Phase 3 involved the administration of post-test and the collection of data. Immediately after the treatment, post-test was administered to the two groups. Students' scores in the post-test were recorded and organized. This phase also included the collection of the students' journal/reflection. Lastly, Phase 4 entailed the interview to ten (10) students in each group and coding the teacher-researcher observations on the conduct of the study.

Ethical Considerations

The study followed all the necessary ethical considerations. The researcher submitted a letter of request to conduct the study to the school principal. Upon the approval and permit from the Schools Division Office Navotas and San Roque National High School, the conduct of the study started. Full consent of the school head and department head of Mathematics in San Roque National High School was also obtained through a hard copy assent letter.

The parents of the student-participants were informed that their child will be part of the study through an online meeting for those who have gadget and internet access, while the parents of the participants who cannot join online were just informed during the distribution of SLMs and both were given letter of consent. Another meeting was conducted for the student-participants to inform them about their participation in the study. They were rest assured that the responses and gathered data were treated with utmost confidentiality. The student-participants have a clear understanding on their part and undertakings in the research. They are not subjected to harm in any ways. Moreover, the anonymity and confidentiality of the participants are preserved by not revealing their names and identity in the data collection, analysis, and reporting of the study findings.

Action Research Process

Planning. Prior to the beginning of this action research activity, the teacher-researcher gather information by reviewing related literature and studies in order to develop an action research plan. The current problem, research gaps or issues were identified considering the teacher-researcher observation, purpose, and interest in proposing the study, the final topic were identified and delimited.

Developing. After identifying the problem and the target goal of the study, the teacher-researcher developed an action research proposal checked and evaluated by research committees. The research methods were designed based on the research questions and variables so that in the completion of the study, the answers and results would be apparent.

Acting. This research was taken into action during the first quarter of the school year 2020-2021. The duration of this research lasted for 6 months; however, the experimentation was done for one quarter only since the teacher-researcher was transferred to another division. The research work plans, and timeline were presented in the study. The data was collected prior to, during, and after the implementation of blended learning.

Reflecting. This step was considered by presenting the teacher-researcher her reflection at the end of this research paper. She was noting observations and writing journal from the beginning up to the end of this research.

Data Analysis

The qualitative data underwent coding and thematic analysis. All the responses in the interview, focus group discussion, and students' journal were transcribed, coded, and analyze narratively for the presentation of the result.

The quantitative data were statistically analyzed using frequency count, percentage, mean, standard deviation, mastery level computation, t-tests. Since the teacher-researcher is a Statistics teacher, she herself has done the statistical analysis of

data. Significance of the difference between the mean scores of the two groups on the pre-test and post-test scores were tested at 0.05 level by applying paired sample t-test and independent samples t-test.

The summary of data was organized and presented in tabular form for the purpose of interpretation. Interpretation of data was made to answer the questions posed in the statement of the problem part. The organized findings became the bases in writing conclusions and in making recommendations.

To interpret the data gathered by the researcher, the following statistical treatments were used.

Mean and Standard Deviation were used as descriptive statistics to determine the measure of central tendency and variability of scores in the pre-test/post-test and in the quarterly academic grades of students. It was specifically used to answer research questions 1 and 2.

The following legend or scale was used to determine the level of learning development of student-participants in Precalculus based on their pre-test and post-test scores.

Percentage of Score	Level of Learning Development
50% and below	Beginning
51% - 70%	Developing
71% - 85%	Approaching Proficiency
86% - 94%	Proficient
95% and above	Advanced

On the other hand, the legend or scale below was used to determine the level of performance of student-participants based on their quarterly academic grades in Precalculus.

Percentage of Score	Level of Performance
74% and below	Did not meet expectations
75% - 79%	Fair
80% - 84%	Satisfactory
85% - 89%	Very Satisfactory
90% and above	Outstanding

Independent Samples z-test was calculated to test the hypothesis on the significant difference in the level of learning development and level of performance of the two groups as measured by their pre-test/post-test and quarterly academic grades at 0.05 level of significance. It was used to answer research questions 3 and 4.

ACTION RESEARCH WORK PLAN AND TIMELINES

PRE-IMPLEMENTATION	<ol style="list-style-type: none"> 1. Gathering of Data (Online survey & pre-test) 2. Setting an action plan 3. Preparing the lesson exemplars and instructional materials (modules, worksheets, and online materials/platforms) Distributing of participants' and parents' consent form	August 2020
IMPLEMENTATION N PROPER	<ol style="list-style-type: none"> 5. Implementation of LIFE BLAST 6. Documentation Focus Group Discussion 	September 2020 - January 2021
POST IMPLEMENTATION	<ol style="list-style-type: none"> 8. Gathering of data (post-test/assessments) 9. Data Analysis Completing the research write-up	February 2021

COST ESTIMATES

Items	Cost Per Unit	Quantity	Total Cost
(Worksheets Reproduction) * Bond Paper Ink	P265 P245	5 reams 4 colors	P1,325.00 P980.00
Internet Connection	P500	4months	P2,000.00
Ring Binding	P60	5 binders	P300.00
Filing Folder	P100/folder	5 pc.	P500.00
Focus Group Discussion	P100	2 persons (4 meetings)	P800.00
Transportation	P50	3 times	P300.00
Tarpaulin Printing	P250	2	P500.00
TOTAL			P6,705.00

FINAL COST

Items	Cost Per Unit	Quantity	Total Cost
(Worksheets Reproduction) * Bond Paper Ink	P265.00 P245.00	3 reams 4 colors	P75.00 P980.00
Internet Connection	P500	4months	P2,000.00
Ring Binding	P60	5 binders	P300.00
Filing Folder	P220/folder	3 pc.	P660.00
Focus Group Discussion	P50	11 persons (2 meetings)	P1100.00
Transportation	P150	3 times	P450.00
Tarpaulin Printing	P250	2	P500.00
TOTAL			P6,785.00

PLANS FOR DISSEMINATION AND UTILIZATION

This study will be disseminated through Virtual Learning Action Cell (LAC), division website, Parent-Teacher Conference, school meeting, INSET and through letters. The final output write-up of this study will be shared to the LRMDS.

RESULTS

This section presents the findings the study. The results were organized based on the arrangement of research questions posed in the first chapter. The discussion was framed by the research questions posed in this study. In addition, other insights garnered in the study are discussed.

Research Question 1. What is the level of learning development of the two groups of respondents based on their pre-test/post-test scores?

Table 1

Students' Level of Learning Development in the Pre-test & Post-Test

Groups	N	PRE-TEST				POST-TEST			
		Mean	SD	%	Learning Development Level	Mean	SD	%	Learning Development Level
Group 1	47	12.34	3.40	24.68	Beginning	29.19	4.51	58.38	Developing
Group 2	33	15.85	4.18	31.70	Beginning	35.61	3.63	71.21	Approaching Proficiency

Table 2 presents the level of learning development of the two groups of Grade 12 student-participants based on their pre-test and post-test results. Group 1 consists of 47 students while Group 2 consists of 33 students.

In the pre-test, the mean score of Group 1 is 12.34 with standard deviation of 3.40, equivalently 24.68 in percentage score. Hence, the level learning development of Group 1 is "Beginning". On the other hand, the mean score of Group 2 is 15.85 with a standard

deviation of 4.18, which obtained 31.70 percentage score, hence, the level of learning development of Group 2 in pre-test is “Beginning”.

In the post-test, the mean score of Group 1 is 29.19 with standard deviation of 4.51, equivalently 58.38 in percentage score. Hence, the level learning development of Group 1 is “Developing”. On the other hand, the mean score of Group 2 is 35.61 with a standard deviation of 3.63, which obtained 71.21 percentage score, hence, the level of learning development of Group 2 in pre-test is “Approaching Proficiency”.

The level of learning development of the two groups of Grade 12 students are the same at the beginning of the quarter. After one quarter, with the use of Self-Learning Modules (SLMs) in Group 1 and blended learning modality with Group 2, both groups improved, yet Group 2 improved better than Group 1.

Research Question 2. What is the level of performance of the two groups of respondents as revealed by their quarterly academic grade in Precalculus?

Table 2

Students' Level of Performance based on their First Quarter Academic Grades

Groups	N	Mean	SD	Performance Level
Group 1	47	83.57	2.64	Satisfactory
Group 2	33	88.30	2.38	Very Satisfactory

Table 2 presents the level of performance of the two groups of Grade 12 student-participants according to their first quarter academic grades in Precalculus.

The mean grade of Group 1 is 83.57 with standard deviation of 2.64, verbally described as “Satisfactory” performance while the mean grade of Group 2 is 88.30 with a standard deviation of 2.38, verbally described as “Very Satisfactory” performance. It can be said that Group 2 performed better than Group 1 based on their first quarter academic mean grade.

Research Question 3. Is there a significant difference in the level of learning development of the two groups as determined by their test scores in Precalculus?

Table 3

Difference in the Level of Learning Development of Students in the Post-test

Groups	N	Mean	Average Deviation	Z-computed value	Critical Value	Decision/ Interpretation
Group 1	47	29.19	4.51	-7.12	±1.960	H ₀ rejected Significant
Group 2	33	35.61	3.63			
<i>Tested at .05 level of significance</i>						

Table 3 displays the result of testing the significant difference in the level of learning development of the two groups of students as revealed by their post-test mean scores. To compare the means and to test the hypothesis, an independent samples z-test was performed at $\alpha = 0.05$.

As indicated, the computed z-value is -7.12 which is less than the z-critical value -1.960 at $p = 0.05$ two-tailed level of significance. The decision is to reject the null hypothesis. This means that there is a significant difference in the level of learning development of the two groups as measured by their post-test.

Research Question 4. Is there a significant difference in the level of performance of the two groups as determined by their academic grade in Precalculus?

Table 4

Difference in the Level of Performance of Students based on Academic Grades

Groups	N	Mean	Average Deviation	Z-computed value	Critical Value	Decision/ Interpretation
Group 1	47	83.57	2.64	-8.48	±1.960	H ₀ rejected Significant
Group 2	33	88.30	2.38			

Tested at .05 level of significance

Table 4 displays the result of testing the significant difference in the level of performance of the two groups of students as revealed by their first quarter academic grades in Precalculus. To compare the means and to test the hypothesis, an independent samples z-test was performed at $\alpha = 0.05$.

As indicated, the computed z-value is -8.48 which is less than the z-critical value -1.960 at $p = 0.05$ two-tailed level of significance. The decision is to reject the null hypothesis. This means that there is a significant difference in the level of performance of the two groups as measured by their first quarter academic grades.

Research Question 5. How does the blended learning modality improve the performance of Grade 12 students in Precalculus?

Research Question 6. At the end of the quarter, what are the insights of the two groups of students about their chosen learning modality?

For research questions 5 and 6, it will be answered through qualitative methods. The presentation of the analysis of the data gathered will be divided into three sections according to the instrument used in the study.

Upon completion of the interviews, focus group discussion, and students' journal, the teacher-researcher transcribed the responses. Codes were categorized into themes and compared to one another. The second level of coding was done, the axial coding method, to further analyze the results from the first two stages and discover how the new categories and sub-categories interrelated with one another. The findings were reviewed and triangulated and then narrated.

Semi-structured interview

Four interview guide questions were asked to the student-participants. First question is, "With your chosen learning modality, do you think you develop your competencies in Precalculus?". From the 10 students selected in each group, majority of

them answered yes and they believed that their chosen modality helped them learn the lessons even a little.

Second question given is, “How does your chosen modality help you develop and achieve the competencies in Precalculus?”. Some of Group 1’s answered are, (1) “*Self-Learning Modules (SLMs) helped me have a reference for learning the competencies*”, (2) “*SLMs allow me to become independent learner*”, (3) “*SLMs make my learning time flexible*”. (4) “*SLMs help me know everything about the content of the lessons in the first quarter*”, and lastly (5), “*SLMs help me know and read the mathematical symbols and information*”. On the other hand, for Group 2, they answered, (1) “*blended learning makes them understand more the lesson through the teaching of the teachers*”, (2) “*online class and modules at the same time filled us with the knowledge we need*”, (3) “*blended learning helps us learn the competencies in different subjects we have*”.

Third question given to the student-participants was “What challenges or hindrances did you encounter to become effective learners in your chosen learning modality?” In Group 1 representatives, the challenges, or hindrances they encountered were (a) the unfamiliar words/terms used in SLMs, (b) lacking solutions and further explanations of situational problems in Precalculus SLMs, and (c) incomplete copy of modules. For the Group 2, the challenges, or hindrances they encountered during blended learning class was (a) unstable or no internet connection, (b) logging or slow function of gadgets, and (c) unorganized teaching using blended learning.

Fourth question was “Will you still choose the same learning modality next quarter?”, 4 out of 10 students from Group 1 representative said “Yes”, while the other 6 students said “No”. For those who answered, they were asked, *why?* The student-respondents answered, “*It is difficult to learn by self only, we still ask our teachers on the lesson*”, “*I prefer to have online class if I only have gadget because our teacher can teach us*”, “*Module help us know the lesson but there are contents that we cannot understand so we need to ask our teachers*”.

For Group 2, 8 out of 10 students answered “Yes” while 2 students answered “No”. Based on the responses, Group 1 who used self-learning modules only wanted to shift to blended learning and Group 1 under blended learning were contented and happy with their chosen learning modality.

Focus Group Discussion

The focus group discussion was done two times during the first quarter with Group 1 and Group 2. In the first focus group discussion, the main agenda of the topic was about the challenges encountered by the two groups in their chosen learning modality. 5 students in each group were randomly selected to participate in the discussion.

The groups were asked, "What are the challenges you encountered in learning your subjects with your chosen modality?"

Group 1 gave their responses.

Student 1: It is difficult to understand some of the terms in the modules. We still need to search the internet or ask the teacher about some technical terms.

Student 2: I have no discipline in answering the modules. Sometimes, I answer the modules when the quarter is near to end.

Student 3: Some of the subjects have no modules, and others have incomplete modules. We cannot track the sequence of the lessons.

Student 4: Too many things to answer in the module. We are loaded with things to do and to submit outputs even though we do not get input from the teachers.

Student 5: For me, the knowledge that we get from the module is not enough, we still need the teacher to teach us to learn the lessons.

Group 2 responses:

Student 1: Sometimes we encounter internet connection problems that made the online teaching to be interrupted.

Student 2: Too many tasks to do, we are doing activities online and in modules. Overload of activities and tasks to do.

Student 3: Sometimes we cannot understand what the teacher is teaching online because there are distractions in the house.

Student 4: My eyes become teary and sometimes they become irritated. Maybe long hours of online expose us too much. Even modular learning, we are online.

Student 5: Some of us are not that good in using technology like turning in our outputs to google classroom. Some of us are having difficulty in using online platforms.

In the second session of the focus group discussion which was conducted at the end of the first quarter before they took the post-test, both groups were asked another topic and this time about the overall benefit of their chosen learning modality and what they can suggest improving the use of their chosen modality.

The groups were asked, “What are the overall benefits of blended learning?” and “What can you suggest to effectively use SLMs or blended learning?”.

Group 1 gave their responses.

Student 1: SLMs help us learn some of the lessons but not to the fullest because we need teachers for us to understand them. We might watch recorded videos of teachers asynchronously.

Student 2: It is helpful but needs improvement. The SLMs should be evaluated and assured that on the level of students' knowledge and understanding.

Student 3: SLMs is easy access and helpful because it is printed yet complete copy of modules should be provided to us and give students the sequence of the lesson to take.

Student 4: SLMs are good and effective yet limit the activities or tasks in the modules.

Student 5: It is still effective for us, but its use should be well planned and managed by the teachers.

Group 2 responses:

Student 1: It is good, and we really learn. It should well-scheduled and organized by the school.

Student 2: Blended learning is recommended. Maybe teachers could teach the way they teach us during face-to-face despite connection problems.

Student 3: We learned from the blended learning, but we cannot say if it is the fullest.

Student 4: It is good, and we learn but limit our exposure to online.

Student 5: It is effective because we learn from our teacher and in the modules, but we need to be familiarized with the use of technology and online platforms used by the teacher.

Students' Journal/Reflection

Two reflections from each group were used to be analyzed in the study. It will be presented below.

Group 1 Student 1:

"...I am using modules in learning my subjects. I am thankful that the school provided us modules because I do not have gadget. Though it is difficult to read them all. It really consumes my time to read and understand them well. Some of the words I cannot understand. But I am glad I am still learning some. Maybe the teachers could limit the content and activities in the modules."

Group 1 Student 2:

"...I learned a lot in the modules that are given to us. Although, it is hard to accomplish them all. I learned but I am not use if I understand them. I think I still my need my teacher in this matter. I can use this as reference but is still different if there is a teacher who teaches us. Using SLMs is not easy but with discipline and time management, I think I can do it..."

Group 2 Student 1:

"...having online learning and answering modules are tiring. When the teacher is teaching the lesson, I can understand what they are teaching. The modules help us get more information on the lessons. It is a good learning way, and I will still choose blended learning next school year"

Group 2 Student 2:

"...Blended learning is effective for me, and it gives us opportunity to continue education despite the pandemic. It helps us to meet our teachers online at the same time have references such as the modules. I learned a lot this quarter and I hope that it will be more organized, and we will be given more consideration on our undertakings..."

Research Question 7. What output may be proposed based on the result of the study?

Based on the result of the study, the teacher-researcher would like to propose a blended learning teacher's guide. This is to support and empower the teachers who are using blended learning. The teacher-researcher found out that teachers have still main role in the remote teaching success. In this blended learning guide for teachers will cover and discuss the key elements of teaching and learning which need to be considered when transferring to a remote learning environment and gives guidance on how to embed these into online practice. As schools work on their contingency plans and more effective basic continuity plan for remote learning for the coming school year 2021-2022, this guide will help the teachers to reflect on their experiences and support their planning for the future blended learning within their schools. It is hoped that this Blended Learning Teacher's Guide will help mitigate the various challenges encountered by the learners, teachers, and the school in the implementation of remote education.

DISCUSSION

Based on the findings of the study, it was found out that, (1) the level of learning development of the two groups of Grade 12 students are the same at the beginning of the quarter. After one quarter, with the use of Self-Learning Modules (SLMs) in Group 1 and blended learning modality with Group 2, both groups improved, yet Group 2 improved better than Group 1; (2) Group 2 who were exposed to blended learning performed better than Group 1 who were exposed to Self-learning Modules only based on their first quarter academic mean grade; (3) The level of learning development and level of performance of the two groups significantly differ as measured by their post-test and first quarter academic grades; (4) Majority of the student-participants believed that their chosen modality helped them learn the lessons even a little; (5) Self-Learning Modules (SLMs) allow me to become independent learner, flexible, disciplined, and learned the lessons;

(6) Online class and modules at the same time filled us with the knowledge we need, helping them learn the competencies in different subjects; Some of the challenges encountered by Group 1 in using SLMs are difficulty in understanding the terms, no self-discipline in accomplishing the activities in the modules, incomplete modules, over load activities, insufficient learning from module and teachers' input is needed; (7) For blended learning, the challenges encountered were internet connection, full load of tasks, distractions at house, teary eyes due to online exposure, and no knowledge or difficulty in using technology.

In literature, there has been various studies which have similar findings with the present study in which these studies also found that blended learning increases the academic achievement of students (Hesse, 2017; Oweis, 2018; Chaney, 2016).

CONCLUSION

The main purpose of this action research was to determine and analyze the effects of blended learning on the academic performance of Grade 12 students. Based on the evidence presented in the data and the findings of the study, the following conclusions are made: (a) the level of learning development of students exposed in blended learning improved more than the students exposed in self-learning modules only; and (b) students in blended learning performed in academics better than students who were exposed to modules only; (c) the learning development of students significantly differ according to the modality used by the students; (d) the performance of students exposed in blended learning significantly differ with the performance of students exposed in self-learning modules only; (e) the blended learning with the combination of teachers' and modules input is able to help cover and learn the most essential competencies in Precalculus; (f) both learning modalities helped the students learn the most essential competencies but online learning significantly contributed to the effective acquisition of those competencies.

RECOMMENDATION

Based on the findings and conclusions of the study, the following are recommended:

(a) The Office of the Schools Division, Supervisors, School Heads and school administrators are urged to come up with a blended learning guide for teachers including defining and fixing the learning plan to be used, choosing of teaching tools, and teaching guides; (b) schools should continue using blended learning and may showcase best practices of the implementation of blended learning; (c) teachers' facilitation and input during the blended learning is suggestive and highly recommended, they are highly encouraged to be accustomed with various educational software and tools to intervene the problems encountered in blended learning, and teachers should be aware of the best practices in implementing blended learning, and appropriate amount of teacher-student interaction are needed so that students will be engaged in remote education; (d) parent are encouraged to be involved in the education of their child since it is very important with the given learning modalities during the time of pandemic. Parents' meetings may be held so that they are aware of the blended learning and help them sway their perceptions to be positive and optimistic about the new normal way of learning; (e) students need to be involved also since they are the ones who are directly affected by blended learning, and it is vital that they be willing to work with the new way of learning to make them successful. They are encouraged also to capacitate themselves on various online teaching and learning platforms; (f) more future similar research are encouraged to be conducted about blended learning and with a larger sample size and more diverse group of participants such as conducting a study with elementary and junior high school level.

REFLECTION

Blended learning can effectively improve the learning development and performance of students in Precalculus subject. However, certain challenges and issues on its use are inevitable. It brings many advantages to today's new normal way of teaching and learning, yet there are challenges to consider as well. With organize and contextualize blended learning activities in school may expand its benefits. It allows education to continue when it otherwise would have been paused. However, this requires more effort and more knowledge and skills to both teachers and students. First, it requires more effort because the teacher would prepare many teaching tools such as modules, presentations for online classes, and online/offline assessments while students are exposed to many activities and tasks to be done both in modules and in online learning. Second, it requires more knowledge and skills to both teachers and students since both should know how to use the technology or the online teaching/learning platform they will be using. In a blended learning setting, it requires more technology use than the usual normal traditional teaching.

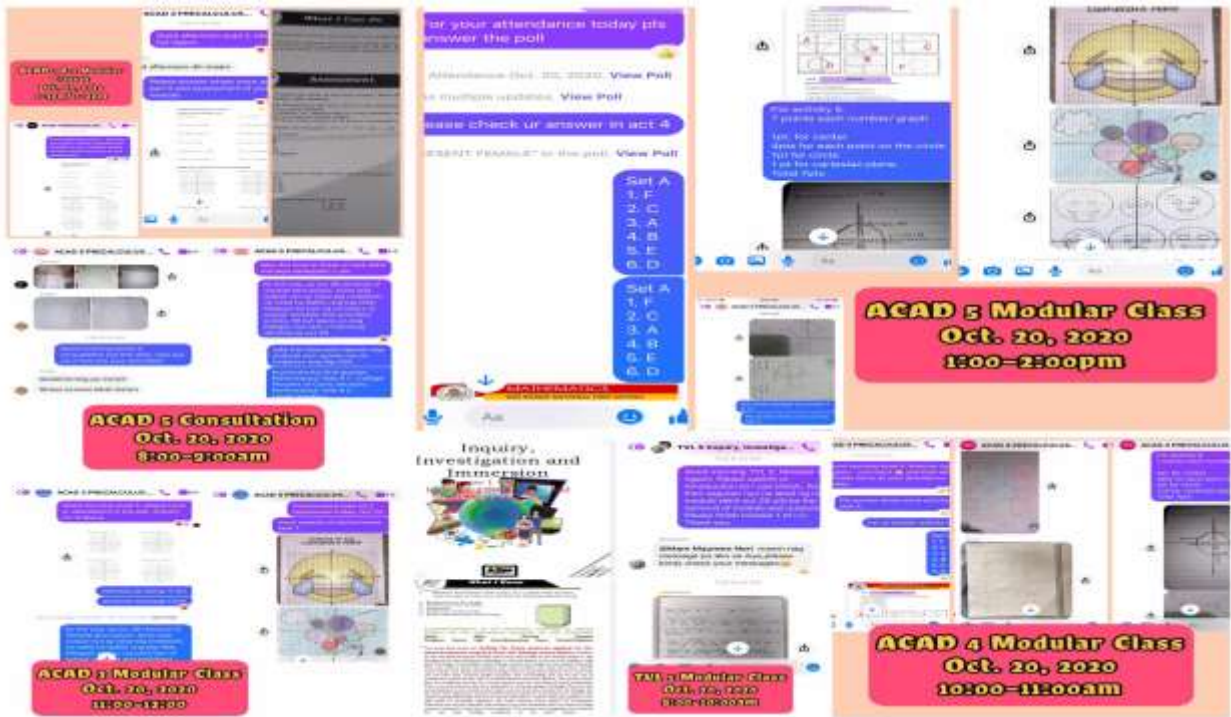
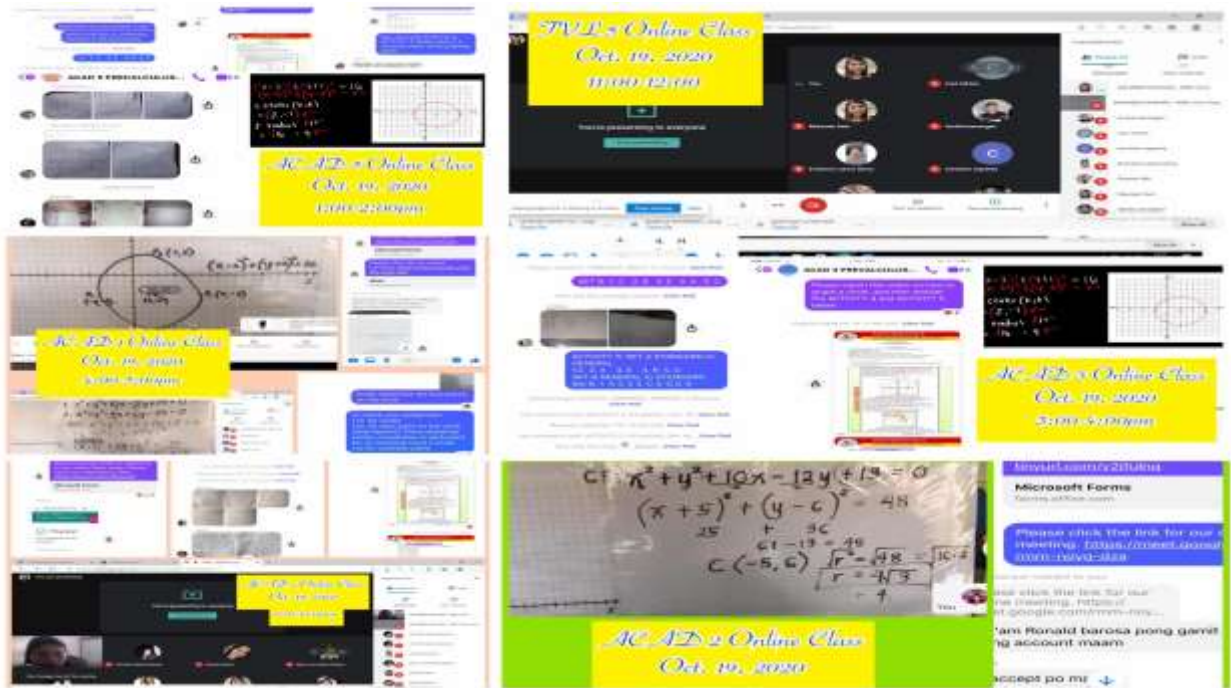
ACTION PLAN

The teacher-researcher plans to design and develop a blended learning guide for teachers wherein it will be useful to implement blended learning effectively in schools. This guide will include the proposed intervention plans and solutions for the challenges mentioned by the participants in this study. The results of the study would be utilized in coming up with various intervention activities and projects that can be proposed to schools. The teacher-researcher also plans to make this researcher broader by finding solutions to the problems or challenges encountered on the implementation of blended learning and the use only of Self-Learning Modules.

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APPENDIX A DOCUMENTATION

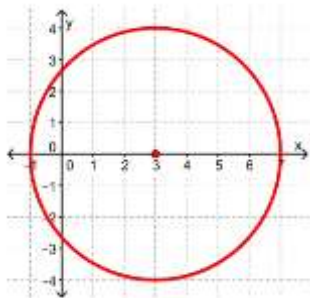




APPENDIX B
PRE-TEST/POST-TEST IN PRECALCULUS
SENIOR HIGH SCHOOL
FIRST QUARTER EXAMINATION in Pre-Calculus
SY. 2020 - 2021

GENERAL DIRECTIONS: Read and understand each question very carefully and choose the letter of the correct answer.

- How will you call the curve formed by intersection of a plane and a double right circular cone?
 A. *Plane – Cone* B. *Conics* C. *Conic Sections* D. *both B and C*
- What will be formed when a plane intersects the cone at its vertex?
 A. *Point* B. *Line* C. *Plane*
 D. *Two Intersecting Lines*
- What conic section is formed when a plane intersects a cone parallel to the base and perpendicular to cone's axis?
 A. *circle* B. *ellipse* C. *hyperbola* D. *parabola*
- When a plane intersects a cone parallel to its side, a/an _____ is formed.
 A. *circle* B. *ellipse* C. *hyperbola* D. *parabola*
- The conic section that will be formed when a plane intersects both nappe of a cone from its lateral face and perpendicular to the base.
 A. *circle* B. *ellipse* C. *hyperbola* D. *parabola*
- A/An _____ is formed if a plane intersects a cone at any angle to the axis.
 A. *circle* B. *ellipse* C. *hyperbola* D. *parabola*
- If C (0, 0) and $r = 7$, then what is the standard form of the equation of the circle?
 A. $x^2 - y^2 = 25$ B. $x^2 + y^2 = 49$ C. $x^2 - y^2 = 49$ D. $x^2 + y^2 - 49 = 0$
- Determine the standard equation of a circle which has a center at (3, 4) and radius 5.
 A. $x^2 - y^2 = 25$ B. $x^2 + y^2 = 25$ C. $(x - 3)^2 + (y - 4)^2 = 25$ D. $x^2 + y^2 - 6x - 8y - 25 = 0$
- Determine the coordinates of the center and length of radius of the standard equation of the circle:
 $x^2 + (y - 5)^2 = 9$
 A. *C (0, 5), r = 3* B. *C (0, -5), r = 3* C. *C (5, 0), r = 9* D. *C (-5, 0), r = 9*
- Give the center and radius of the general equation of the circle: $x^2 + y^2 + 8x - 14y + 50 = 0$
 A. *C (-4, 7), r = $\sqrt{15}$* B. *C (4, 7), r = 15* C. *C (4, -7), r = 50* D. *C (4, 7), r = 50*
- If the center of the circle is at (-6, 7) and tangent to the y-axis, what then is the circle's standard form of the equation?
 A. $x^2 + y^2 = 36$ C. $(x - 6)^2 + (y + 7)^2 = 49$
 B. $x^2 + y^2 = 49$ D. $(x + 6)^2 + (y - 7)^2 = 36$
- Give the general form of the equation of the circle with standard form $(x + 2)^2 + (y + 4)^2 = 16$.
 A. $x^2 + y^2 - 16 = 0$ C. $x^2 + y^2 + 2x + 4y - 20 = 0$
 B. $x^2 + y^2 + 4x + 8y - 36 = 0$ D. $x^2 + y^2 + 4x + 8y + 4 = 0$



13. Formulate the general form of the equation of the given graph of the circle at the left.

A. $(x - 3)^2 + y^2 = 16$

C. $x^2 + y^2 - 6x - 7 = 0$

B. $(x - 3)^2 + (y - 1)^2 = 16$

D. $x^2 + y^2 + 6x + 7y - 25 = 0$

14. What is the standard equation of the circle concentric with $x^2 + y^2 + 2x - 4y = 5$, radius is 7?

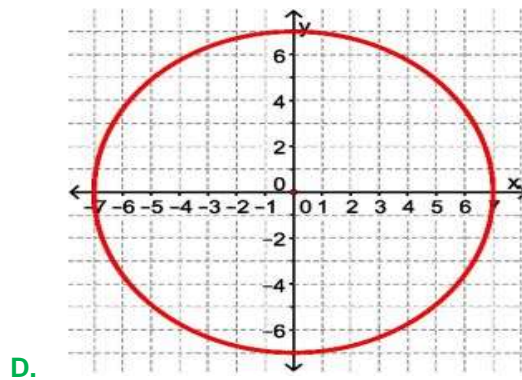
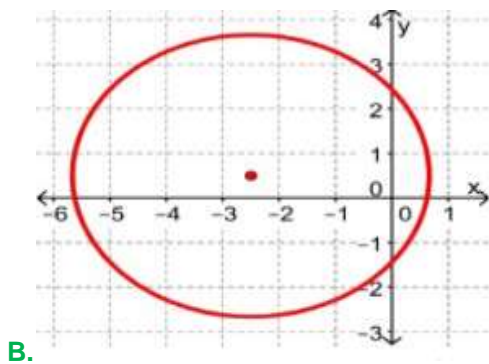
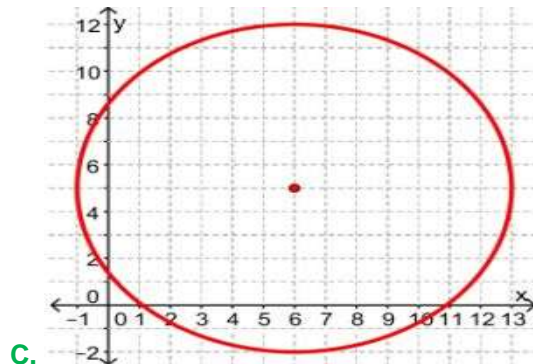
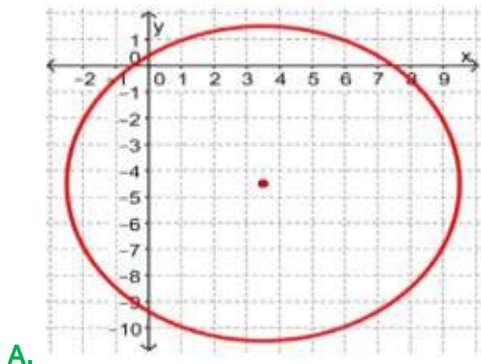
A. $x^2 + y^2 = 49$

C. $(x - 1)^2 + (y + 2)^2 = 7$

B. $(x + 1)^2 + (y - 2)^2 = 49$

D. $x^2 + y^2 + 2x - 4y - 49 = 0$

15. Which of the following graphs will best illustrate a circle whose center at (6, 5) and diameter measures 14 units?



16. What is the focus of the parabola defined by the equation $x^2 = 16y$?

A. $F(0, -4)$

B. $F(0, 4)$

C. $F(4, 0)$

D. $F(-4, 0)$

17. What is the principal axis or the axis of symmetry in the equation of the parabola $y^2 = 4x$?

A. y - axis

B. x - axis

C. $x = 0$

D. both A and C

18. Which of the following is **NOT TRUE** about the parabola whose equation is $y^2 = 4x$?

A. The vertex is at (0, 0)

C. The focus is at (1, 0)

B. The directrix is $y = -1$.

D. The length of the latus rectum is 4.

19. If a parabola has a focus at (0, 3) and directrix given by $y = -3$, then which of the following is its equation?

A. $x^2 = 12y$

B. $x^2 = -12y$

C. $y^2 = 12x$

D. $y^2 = -12x$

20. Where does the parabola open/concave whose equation is $y^2 = -6x$?

A. upward

B. downward

C. to the left

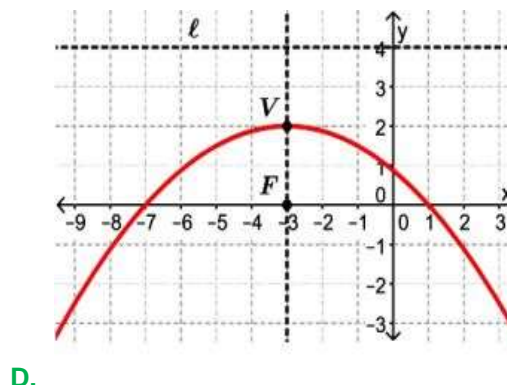
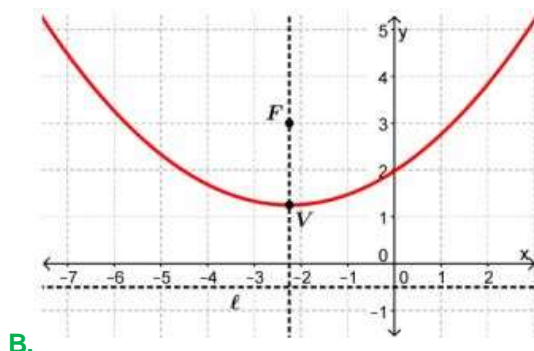
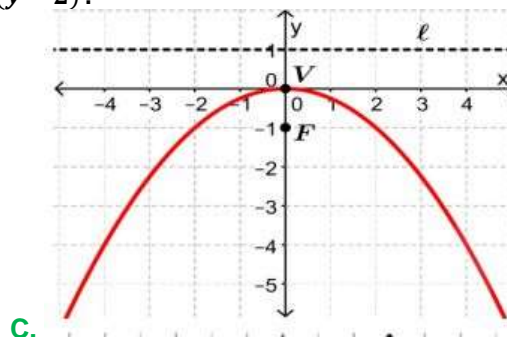
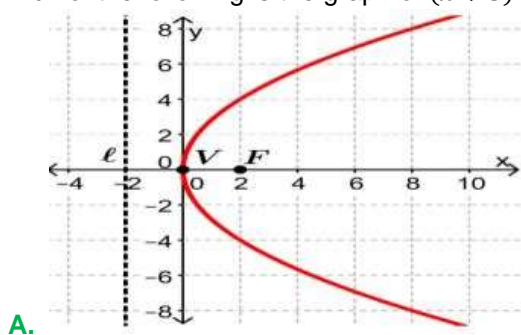
D. to the right

21. Find the endpoints of the latus rectum of the parabola defined by the equation $x^2 = 12x$.
 I. (6, 3) II. (-6, 3) III. (3, 6) IV. (3, -6)
 A. I and II B. III and IV C. I and III D. II and IV
22. What is the length of the latus rectum of the parabola defined by the equation $x^2 = 7x$?
 A. 5 B. 7 C. 12 D. 14

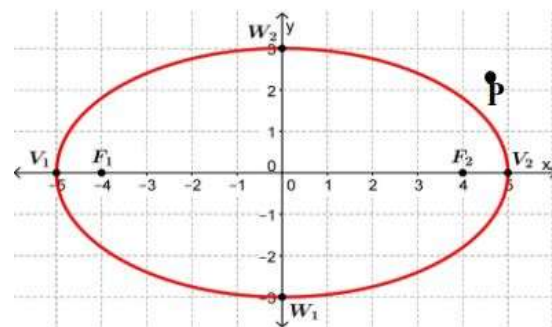
For numbers 23 – 26, refer to the statement in the box.

A parabola satisfying the equation $(x + 1)^2 = 12(y - 3)$

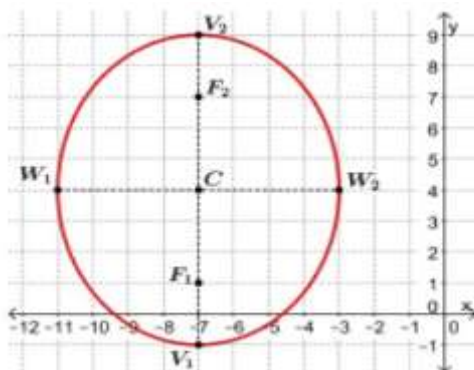
23. What is its vertex?
 A. $V(1, 3)$ B. $V(-1, -3)$ C. $V(-1, 3)$ D. $V(1, -3)$
24. What is its focus?
 A. $F(2, 3)$ B. $F(-4, 3)$ C. $F(-1, 0)$ D. $F(-1, 6)$
25. Give its directrix.
 A. $x = 1$ B. $y - axis$ C. $x = 0$ D. $y = 0$
26. All of the following are points on the given parabola EXCEPT _____.
 A. $(-1, 3)$ B. $(-1, 6)$ C. $(5, 6)$ D. $(-7, 6)$
27. A parabola has a vertex of $(3, -2)$ and focus of $(3, 5)$. Find the standard equation of parabola.
 A. $(y + 2)^2 = -8(x - 3)$ C. $(x - 3)^2 = 28(y + 2)$
 B. $(y + 2)^2 = 4(x - 3)$ D. $(x - 3)^2 = 12(y + 2)$
28. Find the standard equation of a parabola if a parabola has focus $(2, 2)$ and directrix $x - axis$.
 A. $(x - 2)^2 = 4(y - 1)$ C. $(y + 2)^2 = -4(x + 2)$
 B. $(x - 2)^2 = 4(y - 2)$ D. $(y - 2)^2 = 8(x - 2)$
29. The principal axis or the axis of symmetry in the equation of the parabola $(y - 2)^2 = 12(x - 1)$ is _____.
 A. $x - axis$ B. $y - axis$ C. $x = 1$ D. $y = 2$
30. Which of the following is NOT TRUE about the parabola whose equation is $(y - 2)^2 = 12(x - 1)$?
 A. The vertex is at $(1, 2)$ C. The directrix is $y = -2$
 B. The focus is at $(4, 2)$ D. The length of the latus rectum is 12.
31. Which of the following is the graph of $(x + 3)^2 = -8(y - 2)$?



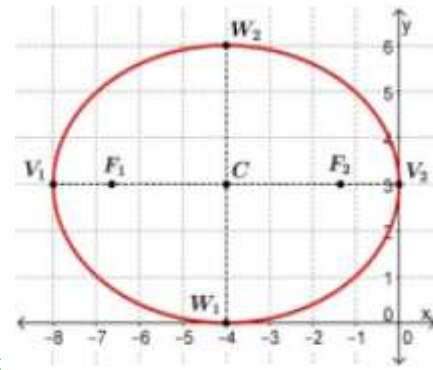
32. Give the general form of the equation of the parabola whose standard form is $(x + 2)^2 = -8(y - 1)$.
- A. $x^2 + 4x + 8y - 4 = 0$ C. $y^2 + 4x + 8y - 4 = 0$
 B. $x^2 + 4x - 8y + 12 = 0$ D. $y^2 + 4x + 8y - 12 = 0$
33. Transform general form of the equation of the parabola $y^2 - 8x - 4y + 12 = 0$ into standard form.
- A. $(x - 2)^2 = 4(y + 1)$ C. $(y - 2)^2 = 8(x - 1)$
 B. $(x - 4)^2 = 4(y - 1)$ D. $(y - 4)^2 = 8(x + 1)$
34. Which of the following is the vertex form of the equation of a parabola $y = x^2 - 2x + 3$?
- A. $x = (y - 1)^2 + 2$ C. $y = (x - 2)^2 + 4$
 B. $x = (y - 2)^2 + 4$ D. $y = (x - 1)^2 + 2$
35. Give the equivalent standard form of the equation of the parabola: $y = 2(x - 4)^2 + 3$
- A. $y = 2x^2 - 16x + 35$ C. $y = 2x^2 - 8x + 3$
 B. $y = 2x^2 - 8x + 19$ D. $y = 2x^2 - 16x + 11$
36. What is the vertex defined by the equation of the parabola: $y = 2(x - 4)^2 + 3$?
- A. $(4, -3)$ B. $(-4, -3)$ C. $(4, 3)$ D. $(-4, 3)$
37. The axis of symmetry of the parabola defined by $y = 2(x - 4)^2 + 3$ is _____.
- A. $x = -4$ B. $x = 4$ C. $x = 3$ D. $x = -3$
38. What is the center of the ellipse defined by the equation $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$?
- A. (h, k) B. (a, b) C. (x, y) D. $(0, 0)$
39. Given the equation of an ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$, find the coordinates of the foci.
- I. $(4, 0)$ II. $(-4, 0)$ III. $(0, 4)$ IV. $(0, -4)$
 A. I and II B. III and IV C. I and III D. II and IV
40. If an ellipse has a vertex at $(0, 21)$ and covertex at $(-12, 0)$, then which of the following is its equation in standard form?
- A. $\frac{x^2}{144} + \frac{y^2}{441} = 1$ B. $\frac{x^2}{12} + \frac{y^2}{21} = 1$ C. $\frac{x^2}{441} + \frac{y^2}{144} = 1$ D. $\frac{x^2}{21} + \frac{y^2}{12} = 1$
41. What is the equation that will best describe the graph at the right?
- A. $\frac{x^2}{9} + \frac{y^2}{25} = 1$ C. $\frac{x^2}{25} + \frac{y^2}{9} = 1$
 B. $\frac{x^2}{25} + \frac{y^2}{16} = 1$ D. $\frac{x^2}{16} + \frac{y^2}{25} = 1$



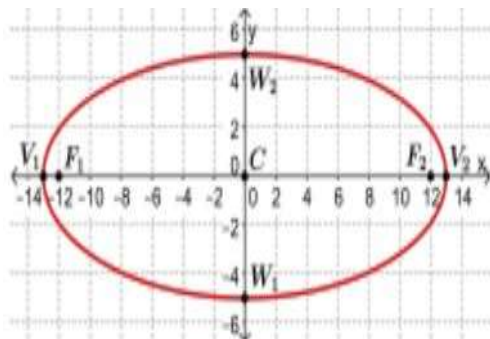
42. Which graph will best illustrate the equation of the ellipse $\frac{(x+7)^2}{16} + \frac{(y-4)^2}{25} = 1$?



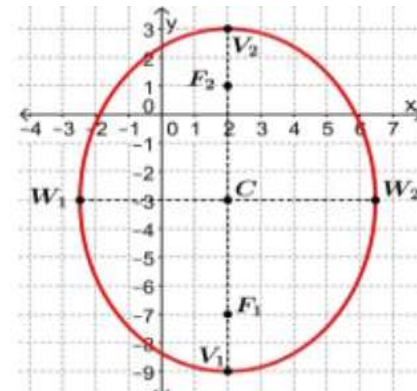
A.



C.



B.



D.

43. Two intersecting imaginary lines that serves as a guide in shaping the graph of a hyperbola are called _____.

- A. center B. focus C. vertices D. asymptotes

44. The center of the hyperbola defined by $\frac{(x-2)^2}{16} - \frac{(y+4)^2}{9} = 1$ is _____.

- A. (2, 4) B. (2, -4) C. (-2, 4) D. (-2, -4)

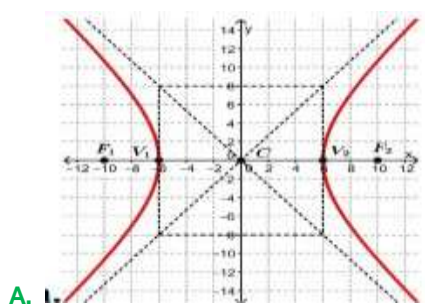
45. What are the endpoints of the transverse axis (vertices) if the standard equation of the hyperbola is $\frac{x^2}{36} - \frac{y^2}{25} = 1$?

- I. (6, 0) II. (-6, 0) III. (0, 6) IV. (0, -6)
 A. I and III B. III and IV C. I and II D. II and III

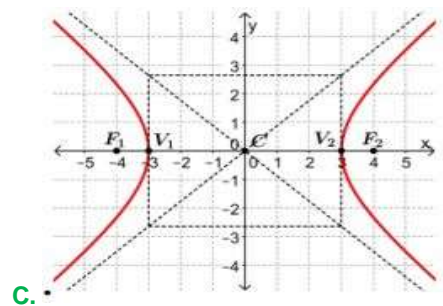
46. Find the coordinates of the endpoints of the conjugate axis (covertices) if the hyperbola is $\frac{x^2}{36} - \frac{y^2}{25} = 1$

- I. (5, 0) II. (-5, 0) III. (0, 5) IV. (0, -5)
 A. I and III B. III and IV C. I and II D. II and III

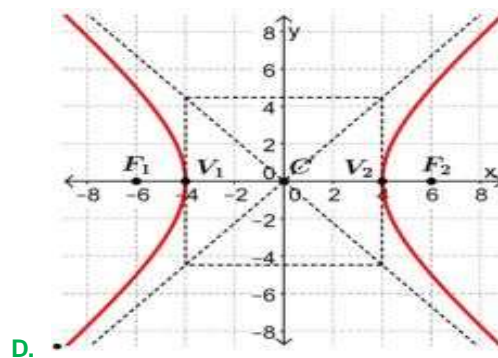
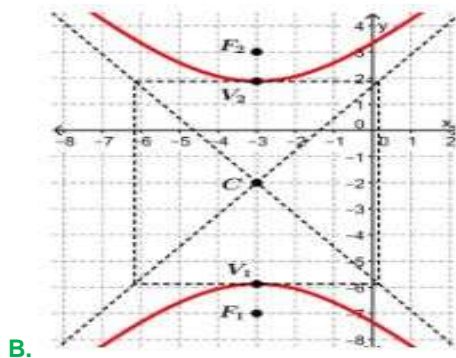
47. Which graph illustrates the equation $\frac{x^2}{36} - \frac{y^2}{64} = 1$?



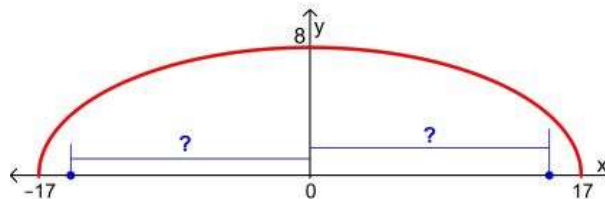
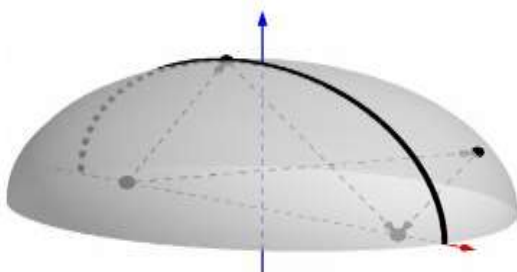
A.



C.



48. A big room is constructed so that the ceiling is a dome that is semielliptical in shape. If a person stands at one focus and speaks, the sound that is made bounces off the ceiling and gets reflected to the other focus. Thus, if two people stand at the foci (ignoring their heights), they will be able to hear each other. If the room is 34 m long and 8 m high, how far from the center should each of two people stand if they would like to whisper back and forth and hear each other?



A. 8 meters

B. 15 meters

C. 17 meters

D. 21 meters

49. How do you call the equations of order/degree two such as conic sections or second-degree equations?

A. *linear equations*

B. *nonlinear equations*

C. *cubic equations*

D. *conic equations*

50. Find the solution set of the system of nonlinear equations: $2x^2 + y^2 = 24$ and $x^2 - y^2 = -12$, using elimination method.

A. $(\pm 1, \pm 2)$

B. $(\pm 3, \pm 4)$

C. $(\pm 2, \pm 4)$

D. $(\pm 4, \pm 2)$

**“If any of you lacks wisdom, you should ask God, who gives generously to all without finding fault, and it will be given to you”
- James 1:5 , God bless!**

DIVISION OF CITY SCHOOLS, NAVOTAS

Bagumbayan Elementary School Compound
M. Naval St., Sipac-Almacen, Navotas City

**First Quarter Periodic Examination in Pre-Calculus
S.Y. 2020 - 2021**

Key to Corrections

NO.	ANSWERS		NO.	ANSWERS
1	D		26	B
2	A		27	C
3	A		28	A
4	D		29	D
5	C		30	C
6	B		31	D
7	B		32	A
8	C		33	C
9	A		34	D
10	A		35	A
11	D		36	C
12	D		37	B
13	C		38	D
14	B		39	A
15	C		40	A
16	C		41	C
17	D		42	A
18	B		43	D
19	C		44	B
20	C		45	C
21	A		46	B
22	B		47	A
23	C		48	B
24	D		49	B
25	D		50	C

TABLE OF SPECIFICATIONS
Pre-Calculus
FIRST QUARTER EXAMINATION
S.Y. 2020 – 2021

COMPETENCY	NO. OF TEACHING DAYS	NO. OF ITEMS	COGNITIVE PROCESS DIMENSION						TOTAL NO. OF ITEMS
			R	UND	APP	AN	E	C	
1. Illustrate the different types of conic sections: parabola, ellipse, circle, hyperbola and degenerate cases	2	2	1, 2, 4, 5, 6						5
2. Define a circle	1	1	3						1
3. Determine the standard form of equation of a circle	7	7			7, 8,9,10, 11, 12, 14				7
4. Graph a circle in a rectangular coordinate system	4	4			13, 15				2
5. Determine the standard form of equation of a parabola	6	6			27,28, 32-35				6
6. Graph a parabola in a rectangular coordinate system	8	10		36-37	16-26, 29-31,				16
7. Determine the standard form of equation of an ellipse	2	2			40		41		2
8. Graph an ellipse in a rectangular coordinate system	3	3		38	39	42			3
9. Define a hyperbola	1	1		36					1
10. Graph a hyperbola in a rectangular coordinate system	4	4			37,38,39,40				4
11. Solve situational problems involving conic sections	1	1				48			1
12. Illustrate systems of nonlinear equations	1	1	49						1
13. Determine the solutions of systems of nonlinear equations using techniques such as substitution, elimination, and graphing	1	1			50				1
TOTAL	48	50	7	4	36	2	1	0	50

APPENDIX C

SEMI-STRUCTURED INTERVIEW GUIDE QUESTIONS

For interview:

1. With your chosen learning modality, do you think you develop your competencies in Precalculus
2. How does your chosen modality help you develop and achieve the competencies in Precalculus?
3. What challenges or hindrances did you encounter to become effective learners in your chosen learning modality?
4. Will you still choose the same learning modality next quarter?

Focus Group Discussion:

Questions:

1. What are the challenges you encountered in learning your subjects with your chosen modality?"
2. What are the overall benefits of blended learning?" and "What can you suggest to effectively use SLMs or blended learning?"

CURRICULUM VITAE

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 Married



EDUCATION

De La Salle University-Manila

Master of Science in Teaching Mathematics (2013- present)

Philippine Normal University

Bachelor of Science in Mathematics for Teachers

Certificate in Teaching English for Speakers of Other Languages
 (2006 - 2010)

AWARDS RECEIVED

Research Exemplar Awardee, Action Research Division of
 Navotas and Region NCR (2017)

Scholar, Navotas Teacher Scholarship (2014 - 2016)

Scholar, De La Salle University-Manila SFA (2013 - 2016)

Scholar, Philippine Normal University (2006 - 2010)

WORK EXPERIENCE

Gov. Juanito Reyes Remulla Senior High School (2021 - present)

Senior High School teacher

San Roque National High School (2011 - 2021)

Senior High School teacher, Grade 12 Level Chairman, JHS
 Mathematics teacher

San Isidro Catholic School (2010 - 2011)

Mathematics teacher

San Roque National High School (2014-present)

Senior High School Teacher II

TRAININGS AND WORKSHOPS ATTENDED

Mentoring and Coaching Reserachers 4.0
 September 27, 2019

Division Research Capability Seminar-Workshop on the Use of
 Statistics in the Conduct of Action Research
 August 16, 2019

2nd Division Research Festival
 December 18, 2018