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ENHANCING STUDENTS' PERFORMANCE IN GRAPHING FUNCTIONS THROUGH FLIPPED TEACHING METHOD

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Abstract

Graphing Functions is one of the essential competencies in General Mathematics that should be mastered by the students. However, based on the latest item analysis, it was found out that this competency has low learning outcome. This study aimed to look into the effectiveness of Flipped Teaching Method in enhancing the performance of Grade 11 students in graphing functions. Using quasi-experimental research design, there were two groups, of 39 students each, were given pre-test about graphing functions. The experimental was exposed to the flipped teaching method while the control was exposed to the traditional way of teaching. The administration of the post- test was done after four (4) class sessions. Using independent samples t-test, the computed p-value is less than 0.001. This implies that there is a significant difference on the post-test scores between the experimental and the control group. Also, the mean post- test score of the students in the experimental group is 17.2821 which is significantly higher than the mean post- test score of the students in the control group that is 13.3077. This is an indication that the performance of the students being exposed to Flipped Teaching Method is better than the students being exposed to the traditional way. Moreover, using the Cohen's d, with an effect size of 2.413682, Flipped Teaching Method has a great effect in the performance of the students on graphing functions.

Keywords: Flipped Teaching Method, Graphing Functions, Mathematics

Introduction

Tracing the history, Mathematics has already been evident as humans have faced the need to measure and communicate about time, quantity, and distance (Maryline, 2021). Mathematics is one of the contributors in the society's growth and development. As stated in the K-12 Mathematics Curriculum Guide, "Mathematics is one subject that pervades life at any age, in any circumstance. Thus, its value goes beyond the classroom and the school". It is in this case that Mathematics should be clearly taught by the teachers and comprehensively learned by the students.

General Mathematics is one of the core subjects that are being taught in the Senior High School. The topics under this are Functions and their Graphs, Business Mathematics, and Logic. This is intended to serve as an introduction to many concepts in Mathematics for the tertiary education (Olivera, 2021).

Graphing Functions is included in the competencies of General Mathematics in Senior High School and is one of the initial competencies that is needed to be mastered by the learners but as a teacher of Tuguegarao City Science High School, a school known for students who are good in Math and Science, the researcher have found out that this competency has resulted to

ISSN: 2799 - 1091
Page No. 41- 46

low learning outcome based on their periodic test for the school year 2017-2018. Item analysis of this periodic test shows that the competency was not mastered. Only 38% of the students got the correct answer in an item under the said competency. Another item only attained a percentage of 56 which means that the competency was also not mastered.

It is then for this reason that the teacher-researcher will have used a flipped teaching method to improve the participation and skills of the student on graphing functions of Grade 11 students of Tuguegarao City Science High School.

This study aimed to improve the participation and performance of the Grade 11 students on the concept of Graphing Functions through Flipped teaching Method.

Specifically, this research study sought to answer the following questions:

1. What are the pre-test mean scores of the control and experimental groups?
2. What are the post-test mean scores of the control and experimental groups?
3. Is there a significant difference on the pre-test mean scores between the control and experimental groups?
4. Is there a significant difference between the pre-test and post- test mean scores of the control and experimental groups?
5. Is there a significant difference on the post-test mean scores between the control and experimental groups?

To answer the questions, the researcher made use of Flipped Teaching Method. Flipped Classroom approach has been widely used to enhance teaching practices in many subject domains and educational levels, reporting promising results for enhancing student learning experiences.

The flipped classroom method was first described in 2000 by Baker, who attempted to provide students with learning materials for outside class and the opportunity to work more collaboratively with teachers and each other during class (Decena, 2021) employed the same process and coined the term “inverted classroom.” They developed this method by showing videos and PowerPoint slides to an undergraduate economics class, receiving positive feedback from students. They also established a more active classroom environment, which is more enjoyable and leads to increased interaction with peers (Bonoan et.al, 2021)). An important advantage of flipped classrooms is that they provide students with the ability to study at their own speed and in their own time (Bangayan-Manera, 2019); they also enhance practice time during lessons (Bangayan- Manera 2020). Previous studies have found that the flipped teaching method decreases stress (Marlowe, 2012) and increases student cooperation, innovation, task orientation, and metacognition skills (Andres, 2019).

In the study, flipped teaching method was utilized in the experimental group using pre-class, in-class, and post-class activities. The teacher has flipped the class by providing lecture videos. The students were tasked to watch the lectures, provided by the teacher, at home and take down notes about the topics covered.

Pre-class:

The first part required the students to watch the videos at home before the school class period. In this stage, students were asked to study at home - on their own, at their own pace and time. They were tasked to watch and take down notes about graphing functions.

In-class:

The second part took place in the classroom and involved teaching techniques and printed material supporting the active participation of the students in the social structure of the class and the efficient use of teaching time. In this stage, students were invited to share in class the knowledge they acquired from the "pre-class”. Learning activities included teacher-

ISSN: 2799 - 1091
Page No. 41- 46

facilitated discussion, brainstorming, independent learning and collaborative learning. Students were given activity sheets to answer individually and collaboratively.

Post-class:

At the end of the session, together, the teacher and the students were able to make a synthesis or summary of the lesson.

Methodology

Research Design

The researcher made use of the quasi- experimental research design to determine the mean scores of the students before and after the employment of the flipped teaching method. The researcher utilized the quasi- experimental design because the study will make use of two groups, the control and the experimental.

Sources of Data

The researcher made use of the purposive sampling technique to identify the participants. Two classes consisting of 39 each, one for control group and one for the experimental group have been used as the participants of the study. Each class was grouped heterogeneously.

Data were gathered through primary source where in scores from the pre-test and post-test of the participants and were directly collected by the researcher.

Data Collection

The experimental method was utilized in the study since flipped teaching method was integrated in the teaching and learning of graphing functions.

Ethical Issues

The researcher observed protocol. The researcher asked permission from the school principal to conduct the study. Since the participants were minors, parent's consent had been secured. Only those with parent's consent were included in the study. Also, the researcher acknowledged the sources.

Data Analysis

The following were used to analyze the data in the study:

- Mean and Standard Deviation. This was used to determine the mean scores before and after the integration of flipped teaching method of the control and experimental groups.
- Independent Samples t-test. This was used to determine the difference between the two groups' pre-test and post- test mean scores.
- Paired t-test. This was used to determine the difference between the pre-test and post-test mean scores of the two groups after the integration of flipped teaching method.

Results and Discussion

This study used the quasi-experimental research design. The 5% level of significance was used as reference level in all analyses.

International Journal of Arts, Sciences and Education
Volume 5 Issue 2 | June 2024
ISSN: 2799 - 1091
Page No. 41- 46

Table 1. Mean, Standard Deviation and Comparison of Pre- Tests of the Control and Experimental Groups

Groups	Mean	Std. Deviation	t-value	p-value	Interpretation
Experimental	8.5641	4.06393	1.286	0.202	Not Significant
Control	7.4615	3.48566			

Table 1 shows that the mean pre-test score of the experimental group is 8.5641 with a standard deviation of 4.06393 while the mean pre-test score of the control group is 7.4615 with a standard deviation of 3.48566. The table also shows that the computed p-value is 0.202 which is greater than the significance level, 0.05. This means that there is no significant difference between the pre- test scores of the experimental and control groups. This indicates that the two groups have the same level of entry competency before the conduct of the intervention. The experimental group and control group are then said to be comparable.

Table 2. Mean, Standard Deviation and Comparison of Pre- Test and Post- Test of Experimental Groups

Experimental Group	Mean	Std. Deviation	t-value	p-value	Interpretation
Pre-test	8.5641	4.06393	-17.085	less than 0.001	Significant
Post-test	17.2821	3.09455			

As shown on Table 2, the pre-test mean score of the experimental group is 8.5641 with a standard deviation of 4.06393 while the mean post-test score is 17.2821 with a standard deviation of 3.09455, making it clear that the scores of the students increased in the post-test as compared with the pre-test. Also, the computed p-value is less than 0.001 which is less than the significance level of 0.05, making the increase from pre-test to post-test significant. This indicates that the Flipped Teaching Method helped improved the scores of the students in graphing functions.

Table 3. Mean, Standard Deviation and Comparison of Pre- Test and Post- Test of Control Groups

Control Group	Mean	Std. Deviation	t-value	p-value	Interpretation
Pre-test	7.4615	3.48566	-12.258	less than 0.001	Significant
Post-test	13.3077	2.82986			

As shown on Table 3, the pre-test mean score of the control group is 7.4615 with a standard deviation of 3.48566 while the post-test mean score is 13.3077 with a standard deviation of 2.82986, making it clear that the scores of the students in the control group increased in the post-test as compared to the pre-test. Also, the computed p-value is less than 0.001 which is less than the significance level of 0.05, making the increase from pre-test to post-test significant. This indicates that there is significant increase in the sores of the students after the exposure to the traditional way of teaching graphing functions.

International Journal of Arts, Sciences and Education
Volume 5 Issue 2 | June 2024
ISSN: 2799 - 1091
Page No. 41- 46

Table 4. Mean, Standard Deviation and Comparison of Post- Tests of the Control and Experimental Groups

Groups	Mean	Std. Deviation	t-value	p-value	Interpretation
Experimental	17.2821	3.09455	5.919	less than 0.001	Significant
Control	13.3077	2.82986			

The table 5 shows that the mean post-test score of the experimental group is 17.2821 with a standard deviation of 3.09455 while the mean post-test score of the control group is 13.3077 with a standard deviation of 2.82986. This indicates that the scores of the students increased in the post-test as compared with the pre-test, making Flipped Teaching Method a great intervention to improve the scores of the students in graphing functions. That table also shows that the computed p-value is less than 0.001 which is less than the significance level of 0.05. which implies that there is a significant difference in the post- test mean scores of the experimental and control groups. This implies that the students performed significantly better after being exposed with Flipped Teaching.

Conclusion

Based on the results, it can be concluded that the Flipped Teaching Method can improve the performance of students on graphing functions. Flipped teaching method can address various problems that are being observed and experienced in classrooms especially in Mathematics class. It can improve teacher-students interaction because the students can be able to share in class what they have learned during their pre-class. Also, it can deal diverse learners because students are given the flexibility of learning. Flipped teaching method can let students ask questions about difficult topics because there is enough time for in-class session.

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ISSN: 2799 - 1091
Page No. 41- 46

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