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RAISE YOUR FLAG: ILLUMINATING PATHS TO ENHANCE STUDENTS' ENGAGEMENT IN MATHEMATICS

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ABSTRACT

The purpose of the study is to determine the effect of Raise Your Flag intervention to enhance students' engagement in mathematics. Hence, the purpose of this study was to determine the significant difference between the pretest and post-test scores of the students. Pre-experimental research design was utilized in this study to measure the effect of the intervention. The data were gathered in 35 students from Grade 9 in Asuncion National High School who were selected through purposive sampling. Data gathering was done through Pretest and Post-test Administration. Findings revealed a substantial difference in the scores before with the mean percentage score of 4.05 (High) and after the intervention in enhancing students' engagement in mathematics with the mean percentage score of 4.43 (Very High). Results also revealed that there is a significant improvement in the students' scores from the pretest to the post-test, with the post-test mean percentage scores that has descriptive level of very high which interpreted as very satisfactory. This substantial difference suggests a strong effect of the treatment to enhance students' engagement in mathematics, it indicates a highly significant and positive impact of the intervention or treatment on the students' performance engagement in mathematics.

KEYWORDS: *Intervention, Enhance Students' Engagement in Mathematics, Raise Your Flag*

INTRODUCTION

Many students often find math challenging, leading to boredom and a loss of interest. Consequently, teachers bear the responsibility of making math classes more engaging. They play a crucial role in employing effective strategies to make math interesting for students. The primary objective is to cultivate essential math skills through methods that promote active learning and ensure participation from all students. The goal is not only to capture students' interest but also to encourage active involvement, laying the groundwork for successful outcomes in mathematical education (Timmerman, 2023).

In Indonesia, as in many parts of the world, numerous students, particularly in mathematics classes, grapple with disengagement, posing a critical challenge with far-reaching implications for academic achievement. This issue demands urgent attention, as a lack of engagement can significantly hinder students' performance in mathematics, contributing to a global educational challenge. Addressing this concern necessitates both local and global efforts to implement innovative and inclusive strategies that reignite students' interest and participation in mathematics education. By acknowledging and tackling disengagement as a shared global challenge, the education community can collaborate effectively to ensure that students worldwide have the opportunity to excel

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in their mathematical learning journeys (Cevikbas & Kaiser, 2022).

In the Philippines, student engagement in education faces significant hurdles, particularly in remote and impoverished areas where access to quality education is limited. The lack of resources and poorly equipped schools exacerbate disengagement, as students struggle to stay motivated in substandard learning environments. Outdated teaching methods and curriculum further contribute to disconnection, as many students find it challenging to engage with material that fails to capture their interest. This disconnect is particularly evident in mathematics education, where a substantial number of Filipino students lag behind global standards. Disparities between public and private schools only compound the issue, highlighting the urgent need for innovative interventions to address this pervasive lack of engagement (Bernardo et al., 2022).

In the Division of Davao del Norte, specifically at Asuncion National High School, the repercussions of the pandemic on students' math education have underscored the emergence of a significant research gap regarding student engagement in mathematics. The noticeable learning gap among students, particularly in comprehending math concepts, has led to a decline in their proficiency in the subject. This gap in understanding poses a challenge to grasping foundational mathematical principles, impacting students' overall academic performance. Teachers, grappling with this disparity, face difficulties in ensuring that all students remain aligned with the curriculum, thereby exacerbating the widening gap in mathematical comprehension. Investigating and addressing the specific factors contributing to the disengagement of students in mathematics at Asuncion National High School will be crucial for formulating targeted interventions and improving the overall effectiveness of math education in the school.

The interest in this study stems from the urgent need to address a crucial problem: the significant learning gap, particularly in mathematics, observed in the Division of Davao del Norte, particularly at Asuncion National High School. This concern is heightened by the notable impact of the pandemic on students' understanding of math concepts, leading to a decline in academic performance. As pre-service teachers, it is vital to acknowledge and tackle this issue promptly. Taking immediate action is essential to bridge this gap, providing necessary support to help students overcome the challenges brought about by the pandemic and thrive in their mathematical education. The research aims to explore and understand the factors contributing to the disengagement of high school students in math at Asuncion National High School, ultimately contributing to the development of effective strategies for enhancing student engagement and performance in mathematics.

In line with this, the researchers have not come across any study in the Philippines, particularly in the locality, that corresponds to the Raise your Flag: Illuminating paths to enhance students' engagement in mathematics of a local college in Davao del Norte. In connection, there had been studies conducted that has similar intention of this study, such as that of Woodcock et al., (2020), entitled "Increasing Student Engagement in Mathematics: The influence of Interactive Whiteboard Technology" tackles the influence of interactive technologies can effectively increase student interest participation in mathematics. Also, another study of Geraets (2021), entitled "The Effects that a Flipped Classroom has on Engagement and Academic Performance for High School Mathematics Students", tackled the flipped classroom intervention to the students. The aforementioned studies specifically focus only on having different intervention on promoting students' engagement on learning mathematics and does not investigate on Raise your flag activity to their students. Thus, the researcher found the necessity to pursue this study to determine whether this intervention could eventually increase their student engagement in math.

Research Objectives

The study aims to determine the effectiveness of Raise you flag intervention as a strategy for enhancing the student engagement among Grade 9 students. Specifically, it sought to answer the following objectives:

1. To determine the level of the students' performance before and after the implementation of Raise your Flag intervention in terms of:
    1.1 behavioral engagement;
    1.2 affective engagement; and
    1.3 cognitive engagement.
2. To determine the significant difference between the scores of the respondents before and after the implementation of Raise you Flag intervention.

Hypothesis

The following hypothesis were tested at 0.05 level of significance to determine the level of significance:

1. There is a significant difference between the pre-test and post-test of students' engagement.

METHODOLOGY

Research Design

The researcher utilized a pre-experimental research approach, specifically a one-group pre-test-posttest design. In this approach, a single case is observed at two distinct time points: prior to the administration of the treatment and subsequent to its conclusion. This would help to assessed changes in the outcome of interest, attributing these changes to the intervention or treatment applied. This design relies solely on the observed changes within the same group to infer the effectiveness of the intervention (ICPSR, 2019).

A purposive sampling, a non-random selection technique was used in this study, where in the total number of participants was 35 students of Grade 9 students, enrolled in the school year 2023-2024. They were chosen as the respondents as they were identified as a group that struggles more with math engagement compared to other sections, making them a perfect target of this study. Also, since this study is all about students' engagement in math and the researchers want to determine the effectiveness of the intervention in their section through having pre-test and post-test.

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The study utilized one adapted questionnaire from web sources to measure the variable. The adapted questionnaire underwent thorough expert validation before dissemination of the research questionnaires towards the students. The instrument for students' engagement with indicators which were behavioral engagement, affective engagement, and cognitive engagement have a Cronbach's alpha value of .93 from the work of Fredricks & McColskey (2012).

The students' engagement questionnaire in math has three components: *behavioral engagement component* with five items, *affective engagement component* with five items, and *cognitive engagement component* with five items. In describing the student engagement questionnaire, the following gradations were used:

Range of Means	Descriptive Level	Interpretation
4.30 - 5.00	Very High	If the measure described in the student's engagement of the respondents is always observed.
3.50 - 4.20	High	If the measure described in the student's engagement of the respondents is oftentimes observed.
2.70 - 3.40	Moderate	If the measure described in the student's engagement of the respondents is sometimes observed.
1.90 - 2.60	Low	If the measure described in the student's engagement of the respondents is seldom observed.
1.0 - 1.80	Very Low	If the measure described in the student's engagement of the respondents is never observed.

RESULTS

Presented in the section below are the results of the data on the raise your flag: illuminating paths to enhance students' engagement in mathematics among grade 9 students. The chapter presents the discussion of the data on students' engagement in mathematics on Grade 9 students on their pre-test and post-tests in terms of behavioural engagement, affective engagement, and cognitive engagement. Also, significant difference between the pre-test and post-test is presented in this chapter.

Level of Pre-test of Students Engagement in terms of Behavioural Engagement

The level of student engagement in terms of behavioural engagement of grade 9 students was measured through a survey questionnaire with the following indicators: behavioural engagement, affective engagement, and cognitive engagement. The responses of grade 9 students were presented and analyzed below.

The level of student engagement in terms of behavioural engagement is presented, analyzed, and interpreted. Reflected in Table 1 is the level of student engagement in terms of behavioural engagement with a corresponding overall mean in pre-test result of 3.96 or qualitatively interpreted as high. This means that the level of student engagement in terms of behavioural engagement is oftentimes manifested.

Table 1: Level of Pre-test of Student Engagement in Terms of Behavioral Engagement

Behavioral Engagement	Pre-Test	Description
1. Actively participating in class activities in math.	3.69	High
2. Working hard in math class.	3.94	High
3. Asking questions in math class or contributed to class discussion.	3.66	High
4. Trying to do well in math.	4.17	High
5. Paying attention in math class.	4.34	Very High
OVERALL	**3.96**	**High**

It could be observed from the data of the pre-test result that the item with the highest mean rating of 4.34 is described to be very High. This means that the item is always manifested by the respondents. This is from item no. 5– *Pay attention in math class.*

As opposed to this, the item with the lowest mean rating of 3.66 in the pre-test result is described to be high. This means that the item is oftentimes manifested by the respondents. This is from item no. 3– *Ask questions in math class or contributed to class discussion.*

Level of Post-test of Students Engagement in terms of Behavioural Engagement

The level of student engagement in terms of behavioural engagement of grade 9 students was measured through a survey questionnaire with the following indicators: behavioural engagement, affective engagement, and cognitive engagement. The responses of grade 9 students were presented and analyzed below.

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Table 2: Level of Post-test of Student Engagement in terms of Behavioral Engagement

Behavioral Engagement	Post-Test	Description
1. Actively participating in class activities in math.	4.57	Very High
2. Working hard in math class.	4.40	Very High
3. Asking questions in math class or contributed to class discussion.	4.43	Very High
4. Trying to do well in math.	4.31	Very High
5. Paying attention in math class.	4.63	Very High
OVERALL	**4.47**	**Very High**

The level of student engagement in terms of behavioural engagement is presented, analyzed, and interpreted. Reflected in Table 2 is the level of student engagement in terms of behavioural engagement with a corresponding overall mean in post-test result of 4.47 or qualitatively interpreted as very high. This means that the level of student engagement in terms of behavioural engagement is always manifested.

Moreover, it could be observed from the data of the post-test result that the item with the highest mean rating in pre-test of 4.63 is described to be Very High. This means that the item is always manifested by the respondents. This is from item no. 5– *Pay attention in math class.*

Also, the item with the lowest mean rating of 4.31 in the post-test result is described to be Very High. This means that the item is always manifested by the respondents. This is from item no. 4– *Try to do well in math.*

Level of Pre-test of Students Engagement in terms of Affective Engagement

The level of student engagement in terms of affective engagement of grade 9 students was measured through a survey questionnaire with the following indicators: behavioural engagement, affective engagement, and cognitive engagement. The responses of grade 9 students were presented and analyzed below.

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Table 3: Level of Pre-test of Student Engagement **in Terms of Affective Engagement**

Affective Engagement	Pre-Test	Description
1. Being very interested in learning new things in math.	4.20	High
2. Being excited about solving difficult math problems.	3.74	High
3. Likely attending math classes.	4.40	Very High
4. Enjoying learning math subject.	4.29	Very High
5. Thinking learning math is fun.	4.11	High
OVERALL	**4.15**	**High**

The level of student engagement in terms of affective engagement is presented, analyzed, and interpreted. Reflected in Table 3 is the level of student engagement in terms of affective engagement with a corresponding overall mean in pre-test result of 4.15 or qualitatively interpreted as high. This means that the level of student engagement in terms of affective engagement is oftentimes manifested.

It could be observed from the data of the pre-test result that the item with the highest mean rating of 4.40 is described to be very High. This means that the item is always manifested by the respondents. This is from item no. 3– *Like attending math classes.*

As opposed to this, the item with the lowest mean rating of 4.11 in the pre-test result is described to be high. This means that the item is oftentimes manifested by the respondents. This is from item no. 5– *Think learning math is fun.*

Level of Post-test of Students Engagement in terms of Affective Engagement

The level of student engagement in terms of affective engagement of grade 9 students was measured through a survey questionnaire with the following indicators: behavioural engagement, affective engagement, and cognitive engagement. The responses of grade 9 students were presented and analyzed below.

The level of student engagement in terms of behavioural engagement is presented, analyzed, and interpreted. Reflected in Table 4 is the post-test result, the corresponding overall mean is 4.44 or qualitatively interpreted as very high. This means that the level of student engagement in terms of affective engagement is always manifested.

Moreover, it could be observed from the data of the post-test result that the item with the highest mean rating in pre-test of 4.63 is described to be very High. This means that the item is always manifested by the respondents. This is from item no. 3– *Like attending math classes.*

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Table 4: Level of Post-test Student Engagement **in Terms of Affective Engagement**

Affective Engagement	Post-Test	Description
1. Being very interested in learning new things in math.	4.49	Very High
2. Being excited about solving difficult math problems.	4.37	Very High
3. Likely attending math classes.	4.63	Very High
4. Enjoying learning math subject.	4.49	Very High
5. Thinking learning math is fun.	4.23	High
OVERALL	**4.44**	**Very High**

Also, the item with the lowest mean rating of 4.23 in the post-test result is described to be High. This means that the item is oftentimes manifested by the respondents. This is from item no. 5– *Think learning math is fun.*

Level of Pre-test of Students Engagement in terms of Cognitive Engagement

The level of student engagement in terms of cognitive engagement of grade 9 students was measured through a survey questionnaire with the following indicators: behavioural engagement, affective engagement, and cognitive engagement. The responses of grade 9 students were presented and analyzed below.

The level of student engagement in terms of cognitive engagement is presented, analyzed, and interpreted. Reflected in Table 5 is the level of student engagement in terms of cognitive engagement with a corresponding overall mean in pre-test result of 4.05 or qualitatively interpreted as high. This means that the level of student engagement in terms of cognitive engagement is oftentimes manifested.

It could be observed from the data of the pre-test result that the item with the highest mean rating of 4.34 is described to be very high. This means that the item is oftentimes manifested by the respondents. This is from item no. 3– *Want to get good grade in math class.*

As opposed to this, the item with the lowest mean rating of 3.74 in the pre-test result is described to be high. This means that the item is oftentimes manifested by the respondents. This is from item no. 5– *Am focused when I study math.*

Table 5: Level of Student Engagement in Terms of Cognitive Engagement

Cognitive Engagement	Pre-Test	Description
1. Setting goal for myself when I study math.	4.14	High
2. Wanting to get good grade in math class.	4.34	High
3. Trying to connect math concepts in real life situations.	4.17	High
4. Trying to develop my own strategy when I solve math problems.	3.86	High
5. Being focused when I study math.	3.74	High
OVERALL	**4.05**	**High**

Level of Post-test of Students Engagement in terms of Cognitive Engagement

The level of student engagement in terms of cognitive engagement of grade 9 students was measured through a survey questionnaire with the following indicators: behavioural engagement, affective engagement, and cognitive engagement. The responses of grade 9 students were presented and analyzed below.

Table 6: Level of Student Engagement in Terms of Cognitive Engagement

Cognitive Engagement	Post-Test	Description
1. Setting goal for myself when I study math.	4.51	Very High
2. Wanting to get good grade in math class.	4.37	Very High
3. Trying to connect math concepts in real life situations.	4.57	Very High
4. Trying to develop my own strategy when I solve math problems.	4.26	Very High
5. Being focused when I study math.	4.20	High
OVERALL	**4.38**	**Very High**

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The level of student engagement in terms of behavioural engagement is presented, analyzed, and interpreted. Reflected in Table 6 is the post-test result, the corresponding overall mean in post-test result of 4.38 or qualitatively interpreted as very high. This means that the level of student engagement in terms of cognitive engagement is always manifested.

Moreover, it could be observed from the data of the post-test result that the item with the highest mean rating in pre-test of 4.57 is described to be very high. This means that the item is always manifested by the respondents. This is from item no. 3– *Try to connect math concepts in real life situations.*

Also, the item with the lowest mean rating of 4.20 in the post-test result is described to be High. This means that the item is oftentimes manifested by the respondents. This is from item no. 5– *Am focused when I study math.*

Summary on the Level of Pre-test of Student Engagement
The summary on the level of student engagement is presented, analyzed, and interpreted. The summary of data revealed on the pre-test result that the level of student engagement of the students has a total mean of 4.05 described as high. This means that the level of critical thinking disposition of mathematics education students is oftentimes manifested.

It can be observed in Table 7 in pre-test result that the indicator, affective engagement, got the highest mean of 4.15 or described as high. This indicates that the level of student's engagement in terms of behavioral engagement is oftentimes manifested.

Table 7: Summary on the Level of Pre-test of Student Engagement

Problem Solving Skills	Pre-Test	Description
Behavioral Engagement	3.96	High
Affective Engagement	4.15	High
Cognitive Engagement	4.05	High
OVERALL	**4.05**	**High**

Moreover, the indicator, cognitive engagement, obtained a mean of 4.05 which means high. This indicates that the level of student's engagement in terms of cognitive engagement is oftentimes manifested.

Lastly, the indicator behavioral engagement, got the lowest mean score of 3.96 which is described as high. This indicates that the level of student's engagement in terms of behavioral engagement is oftentimes manifested.

Summary on the Level of Post-test of Student Engagement
The summary on the level of student engagement is presented, analyzed, and interpreted. The summary of data revealed on the post-test result that the level of student engagement of the students has a total mean of 4.43 described as very high. This means that the level of student's engagement is always manifested.

In line with this, it can be observed in Table 8 in post-test result that the indicator, behavioral engagement, got the highest mean of 4.47 or described as very high. This indicates that the level of student's engagement in terms of behavioral engagement is always manifested.

Moreover, the indicator, affective engagement, obtained a mean of 4.44 which means very high. This indicates that the level of student's engagement in terms of affective engagement is always manifested.

Table 8: Summary on the Level of Post-test of Student Engagement

Problem Solving Skills	Post-Test	Description
Behavioral Engagement	4.47	Very High
Affective Engagement	4.44	Very High
Cognitive Engagement	4.38	Very High
OVERALL	**4.43**	**Very High**

Lastly, the indicator cognitive engagement, got the lowest mean score of 4.38 which is described as very high. This indicates that the level of student's engagement in terms of cognitive engagement is always manifested.

Significant Difference Between Pre-test and Post-test
Presented in Table 9 is the significant difference between the pre-test and post-test of the student's engagement, t(df)= 34, p<.001. The pre-test has the mean of 4.05 and the post-test has the mean of 4.43. The SD of the pre-test obtained a value of 0.28, while, the post-test obtained a value of 0.14. The computed t-value of the pre-test and post-test has the value of -6.926. The p-value of the pre-test and post-test was (p<.001). Since, the probability value of (p<.001) is extremely lesser than the level of significance ($\alpha = 0.05$), the null hypothesis is rejected in this context. This shows that there is a significant difference between the pre-test and post-test.

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Table 9: Significant Difference Between Pretest and Post-Test

Type of Test	N	df	Mean	SD	t-value	P-value	Decision $\alpha = 0.05$
Pre-Test	35	34	4.05	0.28	-6.926	**< .001**	**Significant**
Post-Test	35		4.43	0.14			

CONCLUSION

It was concluded that the level of the students' performance before the implementation of the Raise Your Flag intervention in terms of the three dimensions, namely behavioral, affective, and cognitive engagement indicated a high baseline level of engagement across all dimensions. The pre-test results demonstrated that students were frequently exhibiting behaviors associated with active participation, positive emotions towards learning, and cognitive involvement in math.

Additionally, the results revealed that the level of the students' performance after the implementation of the Raise Your Flag intervention in terms of the three dimensions, namely behavioral, affective, and cognitive engagement is very high. The results indicate a significant improvement in students' engagement in mathematics from the pre-test to the post-test phase.

Moreover, the summary of the level of student engagement across all indicators demonstrates a consistent increase from a high level in the pre-test to a very high level in the post-test. This indicates a robust improvement in students' critical thinking disposition and overall engagement in mathematics education.

Lastly, the analysis of the significant difference between the pre-test and post-test further confirms the effectiveness of the intervention. The computed t-value and p-value suggest a highly significant difference between the two phases, leading to the rejection of the null hypothesis. This indicates that the intervention, "Raise Your Flag," effectively enhanced students' engagement in mathematics from the pre-test to the post-test phase.

Recommendation

The effectiveness of educational interventions in enhancing student performance and engagement is a critical area of study in educational research. This report examines the impact of the Raise Your Flag intervention on various dimensions of student performance, focusing particularly on behavioral and cognitive engagement before and after implementation. Initial findings indicate that behavioral engagement exhibited the lowest mean score among pre-intervention measures, prompting recommendations for targeted strategies aimed at promoting interactive learning environments and encouraging active participation. Subsequent analysis reveals cognitive engagement as the dimension with the most significant improvement post-intervention, suggesting the efficacy of tailored teaching methods and real-world relevance in enhancing student learning experiences. This study underscores the importance of proactive measures in educational practices, advocating for continuous adaptation of curriculum and instructional strategies to sustain and further enhance student engagement and overall academic achievement.

Among the three dimensions of the level of the students' performance before the implementation of the Raise Your Flag intervention, it was determined that behavioral engagement garnered the lowest mean. Hence, the following recommendations are provided: First, educators may employ targeted strategies such as implementing interactive teaching methods, promoting a supportive learning environment, and encouraging active participation in class activities. Additionally, continuous efforts can be made to sustain and further boost students' interest and excitement in learning mathematics through real-world examples, celebrations of achievements, and diverse learning experiences.
Furthermore, for all the dimensions of the level of the students' performance after the implementation of the Raise Your Flag intervention, the researcher discovered that cognitive engagement accumulated the lowest mean. As a result, the following recommendations are made: Teachers may teach students different ways to solve problems in math. They can also show how math relates to real life, which makes it easier to understand. It's important for students to think about how they learn and to be able to control their own learning. Teachers can help by giving different kinds of lessons to match how each student learns best. Working together with classmates can also help students learn better. These methods make learning more fun and help students do better in school.

Moreover, based on the significant difference observed between the pre-test and post-test scores for student engagement, it is highly recommended that teachers and institutions may take proactive steps in response to the significant difference found between the pre-test and post-test scores for student engagement. First and foremost, it is imperative to identify effective teaching strategies that contributed to the improvement in engagement and incorporate more of these into instructional practices.

Additionally, further support can be provided to students who may still be struggling with engagement, ensuring tailored interventions to meet their needs. Continuous monitoring and evaluation are essential to sustain improvements and address emerging issues promptly. Curriculum and instruction may be adjusted based on insights gained from the analysis, promoting interactive and student-centered approaches. Encouraging collaboration and participation fosters an environment conducive to engagement, while offering professional development opportunities for teachers enhances their ability to promote student involvement effectively. Through these actions, teachers and institutions can nurture a supportive and

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dynamic learning environment that maximizes student engagement and learning outcomes.

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