

# ENGAGEMENT IN MATHEMATICS OF FIRST YEAR STUDENTS: A BASIS FOR THE FORMULATION OF AN ACTION PLAN FOR STUDENT-TEACHER INTERACTION

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**ABSTRACT:** Student engagement, according to educators and numerous researchers, is one of the most important factors in being academically successful. The study determined the level of engagement in mathematics of the first-year students of the University of Northern Philippines. The study's findings show that the respondents are predominantly males, from public high schools, and attained fair grades. The respondents have a fair level of engagement in mathematics. The respondents' engagement in mathematics is associated with their profile. An action plan was formulated. Based on the study's results, it is recommended that other student-related factors and dimensions of student engagement be considered in similar studies, and the action plan must be implemented.

**Keywords:** education, teaching, learning, behavior

## 1. INTRODUCTION

Many factors have been found to affect students' academic performance, such as personal and family background, socio-economic background, and learning efforts and preferences. Student engagement, according to educators and numerous researchers, is one of the most important factors in being academically successful. It is critical to reaching various levels of educational experience [1].

The math achievement of students in the Philippines is of great concern. The country usually ranks very low among Asian nations in math. Efforts designed to enhance student engagement in the mathematics classroom hold promise as one way to improve math outcomes. Researchers have found a lot of evidence that student engagement is a key predictor of how well students learn and do in school.

In the past few years, jobs in STEM fields (science, technology, engineering, and math) have grown quickly. So, it is important for the long-term growth of society to help students learn more about STEM and prepare people for careers in STEM. Math, on the other hand, can be the most frustrating of the four subjects [2] which can stop students from choosing a STEM major [3]. The study of [4] for example, found that students may have a lot of anxiety about statistics classes. Meanwhile [5] warned that if a student has a bad learning experience, they might avoid math and even get worried about it. On the other hand [6] came to the conclusion that getting students interested in math classes can not only help them with their future studies but also keep them in STEM fields.

The term "engagement" refers to the extent of a student's active involvement in a learning activity [7]. It involves the effort, interest, and time students invest in meaningful educational experiences inside and outside the classroom.

Student engagement is important for learning because high levels of engagement are linked to positive outcomes like better grades and fewer students dropping out [8, 9]. Some math teachers, like [10, 11, 12], have changed their traditional lecture-based courses to use the flipped (or inverted) classroom method to get students more involved. Under this method of teaching, "things that used to happen in the classroom now happen outside of the classroom and vice versa" [13]. In some flipped math classrooms, teachers show instructional videos to go over basic material before class [14, 15]. So, class time can be used to talk more with the teacher and with other students [14, 16, 17]. Researchers have focused more on student engagement as an integral approach

to addressing low achievement, low interest, and high dropout rates [18]. Researchers and educators agree that engagement is critical for learning. Many types of research established that engagement in the classroom may translate into positive results. As schools try to get students more involved, it's important to know how it's been defined and look at the different ways to measure it.

Interest in student engagement has grown, but it has been defined and measured in a lot of different ways. Feelings of belonging, enjoyment, and attachment are all included in these definitions. More recently, researchers have studied aspects of cognitive engagement, such as students' investment in learning, perseverance in facing challenges, and using deep rather than superficial strategies [18]. They proposed that student engagement has multiple dimensions: behavioral, emotional, and cognitive [18].

Behavioral engagement refers primarily to participation and includes academic, social, or extracurricular activities; it is considered crucial for achieving positive academic outcomes and preventing dropout.

Emotional engagement focuses on the extent of positive and negative reactions to teachers, classmates, academics, and school. Positive emotional engagement creates student ties to the institution and influences students' willingness to work.

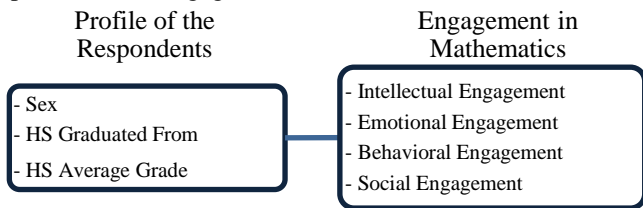
Cognitive engagement is defined as the student's level of investment in learning; it includes being thoughtful and purposeful in the approach to school tasks and being willing to exert the effort necessary to comprehend complex ideas or master difficult skills [18].

A study attempted to establish that student engagement is among the major defining outcomes of teacher effectiveness and teacher engagement [19]. In another research paper, the authors talked about how microdata on youth statistics from official statistical agencies in the Philippines and from different international surveys are used to keep college students interested in learning statistics through data-based activities that are relevant to their lives [20].

It is noticeable that there are very few studies conducted in the country on student engagement in general and much fewer on engagement in mathematics of college students. Mindful of this, the researchers resolved to study the engagement in mathematics of college students and to formulate an action plan for the improvement, if necessary, of their involvement in their mathematics classroom activities.

This study focuses on measuring student engagement in the mathematics classroom through a survey questionnaire with

the conjecture that the students' appraisals of their own mathematics classroom experience offer important information on engagement [21]. Understanding students' engagement in their mathematics classroom can help a teacher understand which aspects of engagement need to be targeted. The results of this study could be very valuable to school administrators in planning and implementing Mathematics faculty development programs to improve Mathematics instruction. The findings of this study would also provide the teachers and curriculum developers with meaningful information concerning student engagement. Thus, this could serve as bases for remedial teaching. The study determined the level of engagement in mathematics of the first-year students of the University of Northern Philippines during the S.Y. 2018-2019 in terms of intellectual engagement, emotional engagement, behavioral engagement, and social engagement. It also determined the relationship between the level of engagement in mathematics of the respondents and their profile. An action plan to improve student engagement in mathematics was formulated.



**Figure 1: Conceptual Paradigm of the Study**  
The study's paradigm (Fig. 1) posits that the student's level of engagement in mathematics is related to their profile.

## 2. METHODS

This quantitative study utilized the descriptive-correlational method of research to determine the profile of the respondents and their level of engagement in mathematics and the relationship between the level of engagement in mathematics and the student-related factors. The population of the study was 430 first-year students of the University of Northern Philippines enrolled in the course Mathematics in the Modern World during the 1<sup>st</sup> Semester, S.Y. 2018-2019.

## 3. RESULTS AND DISCUSSION

**Table 1: Profile of the Respondents**

Profile of the Respondents	Percentage (n = 430)
<b>Sex</b>	
Male	52.3
Female	47.7
<b>Type of High School Graduated From</b>	
Public	72.5
Private	27.5
<b>Average Grade in High School</b>	
95.00 and above	.9
90.00 – 94.99	3.7
85.00 – 89.99	55.0
80.00 – 84.99	38.5
79.99 and below	1.8

Most of the respondents are males (52.3%), have attended public high schools (72.5%), and have a high school average grade of 85.00-89.99% (55.0%). Table 2 presents the summary of the level of engagement of the respondents.

**Table 2: Level of Engagement in Mathematics of the Respondents**

Engagement in Mathematics	Mean (M)	Description
Intellectual Engagement	3.46	High
Emotional Engagement	3.46	High
Behavioral Engagement	3.44	High
Social Engagement	3.04	Moderate
<b>Overall</b>	<b>3.35</b>	<b>Moderate</b>

The respondents have a high level of intellectual engagement (M=3.46). This implies that the respondents are involved intellectually in their math class. The students are willing to exert effort to understand the lessons, participate in discussions, work on problems, and direct their attention toward the tasks given.

The respondents have a high level of emotional engagement (M = 3.46). This implies that the respondents are emotionally involved in their math class. The students have a high feeling of connection to the content, interest in learning, and enjoyment in mathematics. The students averred that they often feel interested and enjoy learning mathematics and knowing how to solve new mathematics problems. Also, they often feel happy when they can finish the given task and feel satisfied when they get good results. However, they often feel very nervous or worried during mathematics tests and anxious when encountering problems they cannot solve.

The respondents have a high level of behavioral engagement (M=3.44). This implies that the students are behaviorally engaged in their mathematics class. The students exhibit considerable positive conduct in their class since they often listen to the teacher's instruction attentively and come to math class early or on time. They are much involved in the learning tasks with persistence since they often concentrate very hard when the teacher introduces new mathematical concepts, study hard to try to understand difficult problems, and persistently work on problems until they get the right answer. However, they only sometimes spend out-of-class math learning.

The respondents have a moderate level of social engagement (M=3.04). This implies that the students are not much involved with their peers, teachers, family members, and other people concerning mathematics. The student often work with other students during class, share ideas and materials with classmates, and use email or social media to communicate with classmates. However, they seldom discuss math concepts and ideas with teacher outside of class and use email or social media to communicate with teacher.

The students have a moderate level of overall engagement in mathematics. This implies that they only have enough effort, interest, and time invested in meaningful educational experiences in mathematics.

The correlation values showing the relationship between engagement and the profile of the respondents are summarized in Table 3.

**Table 3: Correlation between Student Engagement in Mathematics and Profile**

Profile	Engagement in Mathematics					
	Statistic	Intellectual	Emotional	Behavioral	Social	Overall
Sex	$\chi^2$ Cramer's V	9.484* .295*	3.596	10.634* .312*	3.487	.373
High School Type	$\chi^2$	2.930	1.037	3.972	3.312	.597
Average Grade (H.S.)	Spearman's rho	.123	.090	.126	-.086	.114

Legend: \* significant at .05 level

There is a significant relationship between the level of students' intellectual engagement in mathematics and their profile in terms of sex ( $\chi^2=9.484$ ,  $p<.05$ ). This implies that male students ( $V=.295$ ,  $p<.05$ ) tend to have a higher level of intellectual engagement in their mathematics classes. Studies show that male students favor mathematics more than females; thus, they are more likely to be involved intellectually in their math class. An international study, [22, 23], shows that the number of Latin American countries where males have an advantage over females increases between third and sixth grade.

**Table 4: Proposed Action Plan for Improvement of Teacher-Student Interaction and Student Engagement in the Mathematics Classroom**

Area of Concern	Objectives	Strategies	Persons Involved	Budget	Time Frame	Success Indicator
Learning Resources	Enhance the learning materials used	Provide learning resources that supplement the needs of the learners.  Integrate technology in the classroom.	Administrators Teachers	P100,00 .00	From the start to the end of the school year	Learners are motivated to study their math lessons because of the learning materials provided  Technology is utilized in class.
Learning Environment	Build a positive learning environment where learners are encouraged and motivated to engage and let them feel that they are respected, supported, and appreciated	Know the students well and make sure to attend to their needs.  Reiterate to them the value of respect in the classroom.	Administrators Teachers Students	P10,000 .00	From the start to the end of the school year	Students are motivated because they feel that they are supported well.  Students live harmoniously and respect each other.
Students' Mathematical Performance	Enhance the mathematical performance of the students.  Improve the teachers' strategies in teaching math.	Establishment of a support group composed of mathematics enthusiasts to help the mathematically challenged students.  Encourage teachers to use interactive lessons that involve students' participation.	Teachers Students	P20,000 .00	From the start to the end of the school year	Improvement of the academic performance of the students in math.  Mathematics enthusiasts share their knowledge to mathematically challenged individuals through consultations and tutorials.

No significant relationship exists between students' emotional engagement in mathematics and their profile.

There is a significant relationship between the level of students' behavioral engagement in mathematics and their profile in terms of sex ( $\chi^2=10.634$ ,  $p<.05$ ). This implies that the male students ( $V=.312$ ,  $p<.05$ ) tend to have a higher level of behavioral engagement.

There is no significant relationship between the level of students' social engagement in mathematics and their profile.

There is no significant relationship between the student's overall level of engagement in mathematics and their profile.

### 3. CONCLUSIONS AND RECOMMENDATIONS

The findings of the study show that the respondents are predominantly males, products of public high schools, and attained fair grades in high school. They have fair engagement in mathematics. Their engagement in mathematics is associated with their profile. An action plan was formulated. It is recommended that other student-related factors and other dimensions of student engagement be considered in similar studies. Students must be involved in mathematics-related activities to become motivated to be more engaged in mathematics. The action plan must be implemented.

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