# Prediction And Assessment Of Students' Performance In Mathematics In The Modern World (MMW)

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**Abstract**: The study aimed to predict and assess the performance of college students taking up the new general education subject as mandated by Commission of higher education (CHED), Mathematics in the Modern World (MMW). The paper sought to describe the level of performance of the students in their pre-enrolment requirements, such as high school grade point average (GPA) and admission test result, determine and predict these requirements to their mathematics performance and assess the level of difficulty in the topics covered in the subject. There were 100 freshmen students in Bukidnon State University participated in the study. All of them are under the College of Business. Result revealed that the students performed well in high school. However, they are not doing well in college, specifically in Mathematics. The pre-enrolment requirements, such as high school GPA and admission test result do not significantly predict the mathematics performance in college. It has a weak positive relationship with 3% shared variance with MMW's performance. It is, though, contributed to the difficulty experienced by the students in the said subject.

**Index Terms**: High school GPA, Admission test, Assessment, Performance in Mathematics in the modern world.

## 1 INTRODUCTION

The transition from high school to college leads from light to difficult adjustment of the students. Burger (2016) revealed that some students are better able to cope and deal with the transition period than others. Students think that the transition into college life was easy both academically and socially because the senior year of high school helps them to become independent and the teachers prepared them for the thoroughness of college (Cassidy, 2018). The purpose of K to 12 curriculum which offers additional 2 -year education in high school, is to help the students prepare for their college education by providing them sufficient time for mastery of concept and skills (Ganzon, 2012). According to the Commission on Higher Education (CHED), the curriculum enables for a smooth transition from basic education to tertiary education. The Commission on Higher Education (CHED) Memorandum (CMO) No. 20, series of 2013 proposed New General Education Curriculum (GEC) for college, and this includes Mathematics in the Modern World (MMW). It is one of the core courses for everyone to take in college. Admission pre-requisite in colleges and universities includes high school grade point average (GPA) and college entrance test. It is a requirement that test and determine the preparedness of the students in college work. It also assesses their skills if they are fitted to the program they want to enroll. Despite of the government's effort in preparing the students for college life, low math performance in college is still evident. In the midterm examination in their first mathematics subject, for example, the majority (83%) of them got a failed score, and the only 1% got 70% which is also the highest score.

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The students' performance plays a significant role in producing the best quality graduates who will become great leaders and manpower for the country, thus responsible for the country's economic and social development (Ali et al, 2009). Many researchers had conducted studies to enhance students' performance students by applying varied instructional pedagogies and practices like dyad learning (Aguanta & Tan, 2018), flipped classroom (Segumpan & Tan, 2018), concrete-pictorial abstract approach (Salingay & Tan, 2018), rich assessment tasks (Pagtulon-an & Tan, 2018), gradual release of responsibility instructional model (GRRIM) (Saligumba & Tan, 2018); and then enhanced by Asparin and Tan (2018). Other factors like aptitude and occupational interest (Tan & Balasico, 2018), conceptual understanding (Andamon & Tan, 2018), mathematics proficiency (Cordova & Tan, 2018) which are affecting students' performance were also conducted. These studies indicate that performance of students is indeed given more attention and importance by educators in the field. Many studies on the effect of high school GPA and admission test on the performance of the college students were being conducted. However, on the implementation of k to 12 curriculum, the college freshmen is the pioneering batch who were taught with General education subject, Mathematics in the Modern World (MMW). Thus, an investigation if high school GPA and admission test result can still significantly predict the mathematics performance of the student is timely. The assessment of the topics in the newest general education subject is also relevant to identify the effectiveness of the instructional material and teaching strategies used by the teachers.

### 1.1 Statement of the Problem

This paper would like to investigate if high school GPA and admission test can still significantly predict the mathematics performance of the student. It will also aim to assess the difficulty level of the various topics covered in Mathematics in the Modern World. Specifically;

1. What is the level of students' high school GPA?
2. What is the level of admission test of the students?
3. What is the level of mathematics performance of the students?

4. What is the relationship among the high school GPA, admission test and math performance of the students?
5. Which between high school GPA and admission test significantly predict the mathematics performance of the students?
6. What is the level of difficulty on the various topics covered in Mathematics in the modern world?

## 2 METHODOLOGY

### 2.1 Research Design

This study used a descriptive-correlational design in its attempt to determine, describe and analyze relationships between high school GPA and Admission test on the mathematics performance of the students. It also tried to find out the best predictor of the math performance and assess the level of difficulty on the topics covered in the subject.

### 2.2 Respondents and Locale of the Study

The 100 participants of the study are the pioneering graduates of k to 12 curriculum who are currently enrolled as college freshmen of Bukidnon State University, Malaybalay City, Bukidnon in College of Business. They are the first batch of the newest general education subject, Mathematics in the modern World of the first semester, the school year 2018 – 2019.

### 2.3 Data Gathering Procedure

Students enrolled in MMW were the sample. The dissemination of the information about the study was done before giving them the questionnaire. The teacher was also asked for the consent of the students' final grade.

### 2.4 Instrumentation

The students were given a questionnaire with two (2) parts. Part 1 comprises of demographic profile and their high school GPA, and admission test. Part 2 is the list of topics which will cover the whole semester. The students were asked to answer by a 4-point likert scale (1 – very easy to 4 – very difficult).

*The following scoring procedure was used*

| Scale | Score Range | Response |
|---|---|---|
| 4 | 3.26 – 4.00 | Very difficult |
| 3 | 2.51 – 3.25 | Difficult |
| 2 | 1.76 – 2.50 | easy |
| 1 | 1.00 – 1.75 | Very Easy |

### 2.5 Statistical Data Analysis

This study used statistical techniques such as the frequency count and percentage to answer the level of high school GPA, admission test and Mathematics performance (problems 1, 2, 3) In determining the relationship that exists among high school GPA, admission test and mathematics achievement, the correlation was used (problem 4). In predicting the mathematics performance through high school GPA and the admission test (problem 5), regression analysis was used. The mean and standard deviation were used for assessing the level of difficulty of the topics covered (problem 6).

## 3 RESULT AND DISCUSSION

The results, findings, and interpretation are logically arranged in this section according to the statement of the problem.

### 3.1 Level of High School GPA

It is reflected in the students' high school GPA their performance before they enter college. Their level of performance was measured using the DepEd k -12 curriculum grading system. Based on table 1, students performed well in high school, particularly in their last year in senior high, Grade 12. Almost half of the population (46%) has very satisfactory performance. Two out of five students performed outstandingly in their class. Only a small part (3%) performed fairly or developing. This result can somehow be attributed to the two (2) additional years in high school. Ronda (2011) reported that according to Department of Education (DepEd), k to 12 is the one of the solutions to improve the learning competencies of Filipino graduates and increase their chances of getting employed.

***Table 1***
*Distribution of the students' high school GPA*

| Descriptive Rating | Grading Scale | Percent |
|---|---|---|
| **Advanced** | 90 and above | 40% |
| **Proficient** | 85 - 89 | 46% |
| **Approaching Proficient** | 80 - 84 | 11% |
| **Developing** | 75 - 79 | 3% |
| **Beginning** | Below 75 | 0% |
| | Total | 100% |
| **Mean** | 88.72 | **Proficient** |

### 3.2 Level of College Freshmen's Admission Test

An equivalent rating for students' admission test scores was set to identify their entry status in the university. The data was sourced out from Office of the Student Affairs (OSS).

***Table 2***
*Distribution of the students' Admission test*

| Equivalent rating | Status | Percent |
|---|---|---|
| **29% - below** | Failed | 0% |
| **30% - 39%** | Conditional | 82% |
| **40% & above** | Passed | 18% |
| | TOTAL | 100% |

| | | |
|---|---|---|
| **MEAN** | 37.39 | Conditional |
| **SD** | 6.29 | |

Based on table 3, most (82%) of the students have an equivalent rating of 30% to 39%. Only a few (18%) got 40% and above. Generally, the students have conditional status when they enter the university. Nonetheless, nobody failed in the admission test.

### 3.3 Level of College Freshmen's Mathematics Performance

The CHED grading system was used to measure the level of students' performance in Mathematics in the modern world (MMW).

***Table 3***
*Students' level of performance in MMW*

| Grade Point Equivalence | Equivalence | Description | Percent |
|---|---|---|---|
| **1.00** | 96% – 100% | Excellent | 0% |
| **1.25** | 94% – <95% | Very Good | 0% |
| **1.50** | 91% – <93% | Very Good | 0% |
| **1.75** | 88% – <90% | Good | 0% |
| **2.00** | 85% – <87% | Good | 6% |
| **2.25** | 83% – <84% | Good | 21% |
| **2.50** | 80% – <82% | Fair | 44% |
| **2.75** | 78% – <79% | Fair | 18% |
| **3.00** | 75% – <77% | Pass | 11% |
| **5.00** | Below 75% | Failure | 0% |
| | | | 100% |
| **Mean** | **2.00** | **Good** | |

Most (44%) of the students have a fair performance in MMW. Neither of them has a good, very good nor excellent performance. According to Tan, et al. (2018), various factors affect the performance of the students, i.e., teaching processes, strategies, motivation, assessment, and environmental factors. But despite the innovative teaching strategies, grades of the students are still alarming and low. However, none of them failed in the subject. According to Aguanta and Tan (2018), retention test results of students towards the concepts in mathematics is very low. Hence, it affects the performance of the students.

### 3.4 Relationship between students' MMW Performance and Students' high school GPA and their admission test

The relationship between variables, namely; high school GPA, admission test and mathematics performance of the students is shown in table 4.

***Table 4***
*Correlation analysis of students' performance in MMW*

| INDEPENDENT VARIABLES | CORRELATION COEFFICIENT | P-VALUE |
|---|---|---|
| **High school GPA** | - 0.156 | 0.372 ns |
| **Admission test** | -0.165 | 0.360 ns |

*Correlation is significant at 0.05 level/ns – not significant

Legend:

| | |
|---|---|
| ±0.90 to 1.00 | very high correlation |
| ±0.70 to 0.89 | high correlation |
| ±0.50 to 0.69 | moderate correlation |
| ±0.30 to 0.49 | low correlation |
| ±0.00 to 0.29 | little if any or negligble |

Table 4 shows that high school GPA (see table 1) is negatively related to the students' MMW performance since, in the grading system of Bukidnon State University, 1.0 is the highest grade while 5.0 is the lowest (see table 3). The result means that the students' performance in high school is directly proportional to their math performance in college. The higher grades they got in high school, the more they performed better in college. However, there is only a little relationship between the two variables. Only 3% is accounted of the high school GPA to their math performance. P-value (0.372) that is greater than the 5% level of significance which indicates that the relationship exists between the two variables is not significant. Fara (2010) revealed in her study that high school GPA is positively related to the first-semester college GPA. It is also shown in her study that more than 32% of the variation in college GPA is accounted for by the relationship with high school GPA. Admission test has the same relationship with high school GPA towards students' performance in MMW. It has a little negative relationship that exists. It implies that the admission test the students got is high, their performance in math is also high, or if they got a low score in the admission test, it is also possible that the students will not perform well in college. Spera (2009), revealed in her study that the SAT score correlates r = 0.265 to the second term GPA. It supports the result of this study that admission test is directly proportional to the mathematics grade in college. A study by Williford (2009) supports the result. His findings revealed that there is a strong relationship between poor performance in high school courses and failure in college. Additionally, Fu (2012) discovered that the SAT has a medium correlation with first-year college GPA for American students and a high correlation for international students. Together High school GPA and SAT explain one - fourth of the variance in first-year college GPA for American students and over one half of the variance for international students. Belfield (2012) though, showed that placement test scores are positively but weakly associated with college grade point average (GPA).

### 3.5 Predicting Students' Performance in MMW

Since the college freshmen are the pioneering students taking up MMW, it is timely to predict their performance in the said subject by pre-enrolment requirements, such as admission test and high school GPA. The result of the regression analysis is shown in table 5. A model relating the variables is illustrated as:

$$\hat{Y} = 3.19 - 0.0052X_1 - 0.0054X_2$$

Where

$\hat{Y}$ = Performance of student in MMW
$X_1$ = high school GPA
$X_2$ = Admission test score

The model shows that a student will have a grade of 3.0 if high school grade and admission test are equal to zero, which means that if the high school grade and the admission test score will not be considered in the model, the students will

have a passing grade. The addition of the two mentioned variables will increase the grade of a student. In every unit increase in the high school GPA, there is a 0.00523 increase in the math performance of a student. On the other hand, in every unit increase in the admission test score, would mean 0.0054 better math performance of a student. An agreement with result can be found in the study of According to a study participated by more than 1,700 studies which examined the SAT over the past 50 years, the SAT is not only a firm measure of students' academic performance in their first year of college, it can also predict performance throughout a college career. Students with higher SAT scores have a higher possibility to continue in college and complete their education than those with lower scores (Gehring, 2001). Nevertheless, high school GPA and admission test did not show significance in the model which has probability values of 0.657and 0.430, respectively. Mattson (2007) revealed that the Scholastic Aptitude Test (SAT) scores failed to predict success as measured by college while high school GPA significantly predicted the college GPA. Noble, et al. (2004), also noted that high school GPA is not an effective predictor of success at higher levels of first-year GPA. The result of the study refutes the result of D'Aloisio (2016), Belfield (2012), Al-Hattami, et al. (2012) and Fu (2012) which showed that high school GPA and admission test scores are significant predictors in college performance.

### 3.6 Assessing the difficulty level of the topics covered in MMW

The topics listed are based on the CHED proposed syllabus for MMW. The subject is divided into two (2) sections, namely; A. Mandatory subjects and B. Optional topics applicable to the specific program or discipline. Since the participants are students major in business, optional topics discussed were data management and mathematics in finance. College freshmen students found Mathematics in Modern World as a difficult subject. Among the topic, they perceived problem solving and reasoning as the most difficult one. According to Keesy (2011), one of the most difficult parts of mathematics is word problems. She added that a word problem is contained with a mathematical language and conceptual representations that students must analyze to solve word problems. Mathematical language followed as the second difficult subject. The students started to dislike mathematics when the learning becomes more abstract and involves more algebraic thinking (Cai et al., 2004 cited by Xin, 2008).

***Table 5*** *Difficulty levels of the topics covered in MMW*

| A. Mandatory Topics | | | |
|---|---|---|---|
| Section 1:the nature of mathematics | | | |
| TOPICS | MEAN | SD | QD |
| Mathematics in our world | 2.84 | 0.69 | Difficult |
| Mathematical Language and Symbols | 2.95 | 0.40 | Difficult |
| Problem Solving and Reasoning | 2.95 | 0.62 | Difficult |
| B. Optional topics applicable for the specific program or discipline. | | | |
| Section 2: Mathematics as a Tool | | | |
| Data Management | 2.63 | 0.68 | Difficult |
| The Mathematics of Finance | 2.84 | 0.58 | Difficult |
| **Over-all Mean** | **2.81** | **0.16** | **Difficult** |

The student perceived Data Management as the easiest among the difficult topics. Based on the interview with one of the students, the statistics was taught to them during high school, and they conducted research in senior high. This helps them to familiarize and remember the concepts. On the other hand, they found mathematics of finance as difficult because of lacking orientation in the use of a calculator. Some of the students, who belong to the lower class income families do not have or can't afford to buy a calculator. Majority of the students are not computer literate, especially that most of them are coming from remote barangays wherein technology is deficient. Calculators and computers are helpful tools for exploring and solving word problems. It is used to empower students mathematically (Calculators and computers: Tools for mathematical explorati, 1994).

## 4 Conclusion and Recommendations

### 4.1 Conclusion

College freshmen students enrolled in MMW performed well in high school. The majority (46%) of them is proficient, and none are beginners. They didn't perform well in their admission test. Most of the students have conditional status. However, they have a fair performance in their first subject in college. Nobody got an equivalent grade of 83% and above. However, students' high school GPA and admission test scores do not significantly contribute to their performance in mathematics in college. A good performance in the pre - enrolment in college does not guarantee a good performance in college. It is not a significant tool for identifying those students who are more likely to perform well during the first year of college. However, it has a weak and positive relationship, meaning if the pre-enrolment requirements are high, it is possible that their math performance in college is also high. The performance of the students is affected by the level of difficulty they experienced in the topics covered in the entire semester. The student found MMW as a difficult subject for the reasons that the students lack technology such as calculator and they're under-exposed in computers.

### 4.2 Recommendations

According to the result of the study, the following are recommended: Students must take greater responsibility for their own learning and improved motivation in learning. Mathematics teacher must assess their teaching strategies for various topics in the subject, they must be encouraged to use

outcome-based assessment and the strategies, review on the syllabus and evaluate the effectiveness of the instructional materials used. High school teachers are encouraged to review on their IMs used and incorporate the use of technology in their classes. The administration, particularly the office of student affairs to re-evaluate the admission test for possible realignment of the competencies achieved by the students as the result of k to 12 curriculum. The parents must encourage and support the students in their endeavor for a quality education.

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