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Mathematics Performance of Tagbilaran City

Galigao, Abegail P.
COLLEGE STUDENTS, TAGBILARAN CITY, BOHOL
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Abstract:- Mathematics plays a significant role in the majority of human activities. It is an instrument of one's everyday life. The main thrust of this study was to determine the Mathematics Performance of the Tagbilaran City College Students, Tagbilaran City, Bohol during the first semester of academic year 2020 – 2021. Mathematics performance was measured based on three aspects: Academic Performance, Mastery Level, and Proficiency Level of students taking up the Business Mathematics subject. This study utilized in depth correlational quantitative research, and documentary analysis. The researcher used purposive random sampling and chose 256 BS Entrepreneurship and BS Office Administration first year students of Tagbilaran City College using researcher-made instruments. Results showed that majority of the students were in the age range 18 – 21 and female. Most of them took BS Office Administration program, were full-time students, and graduated from K – 12 Curriculum. It was revealed that students' academic performance was Satisfactory. Students proficiency based on the three formative tests taken was at Minimal Level. Seven out of the nine areas in Business Mathematics were not Mastered by the students, within which Depreciation was the least. There is a significant degree of relationship between students' academic performance in Business Mathematics, and students' sex, and program, but insignificant to age, type of students, and secondary curriculum taken. There is a significant relationship between the proficiency level and students' age, program, and type, but found none towards sex, and secondary curriculum taken. There is a significant correlation between Academic Performance and Proficiency Level of the students. There is a significant difference between the academic performance of male and female students but insignificant in terms of Proficiency Level. There is a significant difference on the academic performance, and proficiency level of the students between the two programs. BS Office Administration students overpowered the BS Entrepreneurship students. There is no significant variance between the academic performance and proficiency level of the students at different ages. Significant degree of variance exists on both academic performance, and proficiency level in terms of type of student, and secondary curriculum taken, dominated by Full-time Workers, and Old Curriculum graduates, respectively. There is a significant variance on the Mastery Level in the nine areas of Business Mathematics. The results were the basis in the creation of a Remedial Program for Business Mathematics students in Tagbilaran City College.

Keywords:- *Mathematics Performance, Academic Performance, Proficiency Level, Mastery Level, Business Mathematics, Correlational Quantitative Research, Areas, Chi-square, Spearman Correlation, Mann-Whitney U Test, Kruskal-Wallis Test, Analysis of Variance, Bohol, Philippines*

I. INTRODUCTION

Mathematics plays a significant role in the majority of human activities. The costs of purchasing things, the salaries of employees, and the latest discoveries in science, business, and technology involve Mathematics. Truthfully, the world is deficient without knowing about it.

In the Philippine educational system, mathematics is a central topic across levels and programs. Tertiary education involves Mathematics subjects, taught depending on the level and needs of students. Some learners, however, see mathematics as only intended for high achievers. It is undoubtedly known for its importance, but its delivery has become a persistent problem (Ogena, E. B. et al., 2018).

Business math is a kind of arithmetic course intended to show individuals cash and give them the instruments they have to settle on educated money-related choices. It helps make the intricate details of cash and trade bode well, even to the most math-opposed people, utilizing pertinent and accurate applications (Russell, 2019). It is a course taken by students who did not undergo Accounting, Business, and Management (ABM) Strand in Senior High School (CHED Memorandum 18, series of 2017).

Business Mathematics is the sole math subject taken by first year BS Entrepreneurship (BS En) and BS Office Administration (BS OAd) students of Tagbilaran City College (TCC) in their first semester. It is the fundamental to all other mathematics-related subjects and should be mastered by students. Unfortunately, last academic year, most students got low Academic Performance in Business Mathematics. Some even got failing grades in the subject. Thus, it is undeniably true that adjustments in enriching the delivery of Mathematics instruction are necessary.

The deficiencies mentioned above urged the researcher to determine the Mathematics Performance of students in Tagbilaran City College, specifically, in Business Mathematics. The students' profiles in terms of age, sex, program, type of student, and secondary curriculum taken by students' undergone analysis. Academic performance is part of students' performance. The proficiency level of the students based on results of Formative Tests was also a consideration. Moreover, the Mastery Level in the nine areas of Business Mathematics was analyzed to identify which were quite challenging to understand and develop a remedial program for Tagbilaran City College students.

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II. THEORIES

Sternberg's Theory of Successful Intelligence (1997) showed association with arithmetic performance. Intelligent people achieve objectives with success by finding out the strengths and weaknesses, then capitalizing on the strengths and fixing or compensating for the weaknesses. Specifically, the individual must be creative thus as to return up with novel and helpful ideas; analytical to see that the ideas are good; practical to use those ideas and persuade others of their value; and wise to confirm that implementation of the ideas can facilitate guarantee a typical sensible through the mediation of positive moral principles.

Kolb's Experiential Learning Theory (1984) and Piaget's Cognitive Development Theory (1936) claims that learning requires the development of abstract principles that can be implemented flexibly in a variety of contexts. Both focuses on seeing how students gain knowledge and on understanding the concept of intelligence. Piaget claimed that students play an active role in the learning process, as they conduct experiments, make observations, and think about the environment, behaving much like little scientists. In addition, students have different paces of learning and the Social Artist Theory of Vygotsky (1978) states this matter.

Motivation theories such as Edwin Lock's Goal Setting Theory (1968), and Deci and Ryan's self-determination Theory (1985) stresses that the degree of motivation depends on the type of objectives set and how internal and external factors have been handled that influence the process between identifying goals and the achievement of goals. It claims that the degree to which students fulfill these basic needs shapes their levels of motivation. Thus, leading to completion and deep interest in accomplishing a goal. This was further explained by Pintrich (2003) that self-regulation is the key towards attaining a goal. It explains that the learner himself determines the goals of the learning activities and tracks, regulates, and controls the cognitive and motivational mechanisms to achieve the goals.

According to Boekaerts&Corno (2005) motivated learners ensure that engaging in the learning task does not result in too much distortion in the his/her well-being. There is considerable research indicating that self-regulatory strategies improve learning and achievement (Zimmerman, 2008). Moreover, research has also shown how self-regulation is related to academic emotions in predicted (i.e., positive and negative) ways (Titz, 2001, cited in Pekrun et al., 2002). Drawing from the findings of these related studies, they predicted that self-regulation would be positively associated with positive emotions and achievement. They based this hypothesis on assumptions of the control-value theory of academic emotions, which incorporate assumptions of expectancy-value theory (Weiner, 1992). Thus, self-regulating students who experience enjoyment and pride during the learning task are likely to value both the task and the outcomes. Thus, they are more likely to attain higher levels of learning achievement due to their self-regulation.

III. RELATED LITERATURE

Business Mathematics is designed to equip individuals about money and supply them with the resources they have to form informed financial decisions (Russell, 2019). Business math teaches about the specifics of finance connected with the ownership and operation of a company and provides helpful advice and single finance-related knowledge.

The Commission on Higher Education (CHED) issue is the way Mathematics is taught (Van de Watering & van der Rijt, 2006). CHED sets the national mathematics education curriculum requirements that should be met by all Higher Education Institutions (HEIs) for uniformity in desired learning outcomes and harmony in teaching practice. Nevertheless, the program must grow Filipino learners with high achievement and efficiency, quality of life, and pride in their country for quality assurance. Thus, the teaching-learning process should be improved.

Academic productivity serves as the indicator of students' ability to achieve educational aspirations in the school setting (Salami, 2008). It is the level of expertise demonstrated in a field compared to the average and typically calculated using the grade point for an average (Torres & Rodriguez, 2006 quoted by Willcox, 2011). At the tertiary level, the adaption of CHED Memorandum Order No. 37 series of 2012 served as the fundamental guide in assessing students' academic achievement in the Philippine education system. The policies and guidelines stipulated emphasized Outcomes-based Education as an approach towards learning which focuses on producing graduates that will meet the acceptable level of knowledge, skills, and attitudes demanded by their different fields of practice. It also elaborated the considerations of the diversity of learners in the classrooms and the need for varied ways of assessing different learning potentials and abilities.

The Proficiency Level of students can be measured by assessments done in the classroom. According to Alber (2014), formative assessments, rather than being used at the end of a unit or course of study, can be used during teaching. There is a risk that teaching will slow if teachers find the need to re-teach or revisit content that the students completely did not understand, but that is why formative tests are made.

Learners vary in their type. Some are studying full-time. There are those who are part-time employees that are usually working and studying at the same time (Si, 2017). Others are also having full-time work in addition to studying. The challenge for college learners with part-time work is to arrange with the employers regarding their schedule so school and work hours. For full-time workers, the challenge is greater.

Mathematics is not just a fascinating topic, but also tricky. Several researchers identified a variety of factors that contribute to students' poor performance in this subject. The studies of Alpacion et al. (2014) and Korhonen et al. (2014) found that students' academic performance was found to be adequate, according to the results. However, Andaya (2014)

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found that 1) student achievements in Math Courses (Fundamental Mathematics and Contemporary Mathematics) are poor; 2) students perform poorly in both subjects; 3) mathematics achievements are strongly correlated with individual and academic factors and are moderately correlated with factors of classroom management and assessment;4) the individual factor and therefore the educational factor has a significant effect on achievements in fundamental mathematics; 5) the amount one indicator of accomplishment in contemporary mathematics is that the educational factor; 7) the tutorial factor is that the factor that almost all determines the achievements of mathematics students.

Centered on the Program for International Student Assessment (PISA) 2009+ and 2012 datasets, the study of Thein (2016) aimed to examine Malaysian students' success in mathematics literacy from gender and socioeconomic perspectives. In PISA 2012, the results showed that girls scored about eight points higher than boys in mathematics literacy. In addition, girls outperformed boys in all three mathematical material groups and processes by a wide margin. In PISA 2009+ and PISA 2012, however, the proportion of boys in school had no significant interaction impact with gender and ESCS at the student level on mathematics results. However, after monitoring socioeconomic status at the student and school level, boys and girls performed equally well (Tine et al., 2013; Owolabi&Etuk-iren, 2014; Waldman &Aviolo, 2015). On the contrary, several studies found a connection between the performance of male and female students (Elwan&Alwan, 2013; Bolarinwa et al., 2016). This studies further claimed that females were performing that males.

Other factors affecting mathematics performance were found by several researchers. Bolarinwa et al. (2016) found that in the School of Part-Time Studies Day, School of Part-Time Studies-Regular, School of Part-Time Evening, and School of Part-Time Studies Annexes, the study of the strength of the gender relationship is tiny, but it is negatively strong in the Full-Time program. Jayanthi et al. (2018), and Ali et al. (2013) found that age, father/guardian social, economic status, and regular study hours all significantly impact graduate students' academic success. Laging&Vobcamp (2017) also found that the form of high school graduation, final school grades, prior experience, and self-confidence are all essential determinants.

A developing number of scholars are working while at school and to an extent. This urged Darolia (2014) in his study "Working (and studying) day and night: Heterogeneous effects of performing on the tutorial performance of full-time and part-time students." Utilizing broadly representative information from the 1997 National Longitudinal Survey of Youth, he breaks down the impact of addressing work and credit fulfillment for school understudies within us. Results showed no proof that students' grades are stricken by minor work hours, yet that full-time students total fewer credits per term when expanding work. Other studies yielded similar results. Cinamon (2018), and Triventi (2014) found that social help, number of working hours, and the opportunity to choose to figure were related to assistance relations, which were related to more noteworthy life fulfilment, higher school grades, and better scholarly conduct. Wang et al. (2010) found that doing part-time jobs enriches students' varsity lifetime and improves their social support network.

The impact of student employment has positive and negative results. Byun et al. (2014) found that students' GPA is over normal despite the time went through on part-time work. Be that because it may, in very few cases, the time required to finish off ponders more prolonged than people who do not have part-time employment. This was contradicted by the studies of Evan et al. (2014), Richardson et al. (2014), Wenz & Yu (2010), and Singh & Ozturk (2010) which found that students' performance was affected negatively. They claimed that most students sacrifice the study's long-term advantage against the more immediate financial benefits provided by work, resulting in an agreed decrease in academic performance as a result.

Understanding of Business Mathematics is essential for students of secretarial administration (James, 2013) and of entrepreneurship (Udonsa, 2015). Secretaries execute routine tasks with great speed, helping to increase job performance. For entrepreneurs, it gives requisite numerical assistance without being able to deal with issues of mathematical significance in business. Therefore, the paradigm shift in the education system is assumed to be the revision of education policies to the entrepreneurial base to resolve youth and graduate unemployment, high poverty rates, overdependence on foreign products and technology, and low economic growth.

Bhowmick et al. (2017), in the study Marketing Students' Mathematics Performance: The Mediating Role of Math Anxiety on Math Self-Concept and Math Self-Efficacy, stated that past empirical studies indicate that, in general, marketing undergraduates perform poorly in quantitative-based operations. This may be due to a negative orientation about the subject. Hyesang et al. (2016) stated that mathematics anxiety is related to poor math performance, which is especially widespread across the world. Current behavioral and psychophysiological research shows that both individual (cognitive, affective/physiological, motivational) and environmental (social/contextual) factors are linked to the math anxiety-math performance relation to alleviating the link between math anxiety and math performance.

Assesments serve as proof of learning. According to Brookhart S.M. (2009), classroom assessments aim to decide students' progress towards mastering the objectives of classroom learning. Most methods of classroom evaluation are criterion-referenced, i.e., the achievement is assessed against achievement benchmarks, although the requirements are not always straightforward. This reflects a transition from older approaches that were far more to be norm-referenced, i.e., by comparing students to each other, performance was calculated. This transition took place gradually and willingly in some nations, and it has been a deliberate reform in others (Bethell&Mihail, 2005; Cumming & Maxwell, 2004). This is opposed to

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standardized testing, where success is always norm-referenced, that is, calculated against the success of other students.

Buchholtz et al. (2018) and Gerritsen-van et al. (2017) conceptualized the quality of assessment in tertiary education by providing an overview of the quality of assessment criteria, their impacts, the assessment of the quality of assessment criteria, and the perspectives that should be considered when assessing the quality of assessment. Rakoczy et al. (2019) created and implemented a formative appraisal intervention for mathematics instruction in this study and examined whether it affected the interest and achievement of students directly and through the understanding of students of the usefulness of input and their self-efficacy. Path analysis findings suggest that in the formative evaluation condition, the feedback was viewed as more beneficial, self-efficacy was more significant, and interest appeared to increase; success in learning did not vary between the classes.

Kyaruzi et al. (2019) and Mintra et al. (2009) explored the influence of the expectations of mathematics teachers' formative appraisal activities and feedback delivery on their feedback usage and mathematics performance by secondary school students. Survey results from Structural Equation Modeling (SEM) found that the expectations of students of the quality of teacher feedback delivery and perceived scaffolding positively predicted the use of feedback by students, while perceived monitoring predicted harmful use of feedback. Van de Watering, G., & van der Rijt, J. (2006) found that students tend to be stronger estimators of the complexity of objects. Furthermore, the correlations between the expectations of students on difficulty levels of evaluation items and their performance on the evaluations were examined. The results show that the students who performed the best on the evaluations most underestimated their success.

Learning in the new normal is done online. Faber et al. (2017), and Alday&Panaligan (2010) investigated the impact of a digital formative assessment instrument on the achievement and motivation of mathematics in primary education in grade three (n schools = 79, n students = 1808). The intensity of use measurements by students support the results observed on the achievement and motivation of students. Also, for high-performing students, achievement effects were higher.

Being proficient in mathematics includes being a strategic and analytical thinker and problem solver, possessing rich and linked mathematical knowledge, and having productive mathematical beliefs and dispositions (Schoenfeld, 2015). In the Common Core State Standards for Mathematics, this extensive collection of mathematics objectives is central. Dhlamini&Luneta (2016) studied the degree of mathematical proficiency shown by grade 12 learners in response to matric mathematics examination questions in the Gauteng Province of South Africa. Results showed that learners were most proficient in examination questions on analytical geometry that measured only procedural information on all four subjects. Most students were not proficient in procedural and conceptual skills in examining questions on sequences and series, differential calculus, and trigonometry. These results suggested that students left high school without proficiency in these subjects, which made up the majority of the prerequisite mathematics course in engineering and other university programs. This is in connection to Imam et al. (2014) which revealed that overall student success in reading comprehension and arithmetic was rated as low mastery.

Instructing and understanding arithmetic may be a massive worry in any instructive framework. Different analysts make significant endeavors to find the explanations for students' presentation within the subject (Guinocor et al., 2020). It was discovered that there's an enormous positive high connection between examination directions of the understudies considering their scholarly exhibition regarding their Graded Point Average (GPA) in Mathematics subjects. It had been presumed that the examination directions of understudies vary.

Johnson and Kuennen (2017) defined the student characteristics are most associated with progress, emphasizing the relationship between student math skills and course results, as assessed in the course by student grade. In an introductory statistics course, the science portion of the ACT exam and the math-quiz score are essential to success, as are student GPA and gender. Across course styles and teachers, this outcome is robust. These findings are relevant for the creation of curricula, course material, and prerequisites for the course.

Noureen& Sheikh (2016) aimed to create a problem-solving test for students in class six and evaluate their problem-solving abilities. The Framework of Mathematics Assessment, created by the National Assessment of Educational Progress, is used to create a test (NEAP). The average student score in Algebra is higher than in any other subject, while performance in Ratio and Proportion is poor. As a result, students have average problem-solving skills in variables and multiples, geometry, integers, knowledge handling, linear equations, and whole numbers.

Masui (2012) aimed (a) to further explain the role of study time in academic performance while taking under consideration student characteristics (e.g., gender, prior domain knowledge) within the setting of the active, assignment-based method at Hasselt University (Belgium)(b) to research the link between a range of characteristics of the scholar and therefore the course and study time. Course characteristics were good predictors in terms of study time. Waldman &Aviolo (2015) also found that experience, occupational type, and age, race accounted for a significant amount of variation in test results.

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IV. THE PROBLEM

The main thrust of the study was to determine the Mathematics Performance of Tagbilaran City College Students, Tagbilaran City, Bohol, AY 2020 - 2021. The findings of which served as the basis of proposing a remedial program. Specifically, it sought to answer the following questions:

1. What is the profile of the students in terms of:
   - age;
   - sex;
   - program taken;
   - type of students; and
   - secondary curriculum taken?
2. What is the Academic Performance of the students in Business Mathematics?
3. What is the Business Mathematics Performance of the students based on the results of formative tests as to the following:
   - Proficiency Level; and
   - Mastery level in the different areas
     - Fractions, Decimals, and Percent;
     - Ratio and Proportion;
     - Markup, Markdown, Discount;
     - Interest;
     - Mortgage and Amortization;
     - Commission;
     - Salaries and Wages;
     - Depreciation; and
     - Analysis and Presentation of Business Data?
4. Is there a significant degree of relationship between students' profile and the following:
   - Academic Performance of the students in Business Math; and
   - Proficiency Level?
5. Is there a significant degree of correlation between Proficiency Level and the Academic Performance of the Students in Business Math?
6. Is there a significant degree of difference between the students' performance in Business Mathematics when grouped according to:
   - sex; and
   - program taken?
7. Is there a significant degree of variance on the students' performance in Business Mathematics when grouped according to:
   - age;
   - type of students; and
   - secondary curriculum taken?
8. Is there a significant degree of variance in the Mastery Level of the nine areas in Business Mathematics?
9. Based on the findings, what remedial program could be proposed?

Null Hypotheses

HO1: There is no significant degree of relationship between students' profile and the following:
- Academic Performance of the Students in Business Math; and
- Proficiency Level.

HO2: There is no significant degree of correlation between Proficiency Level and the Academic Performance of the Students in Business Math.

HO3: There is no significant degree of difference between the students' performance in Business Mathematics when grouped according to:
- sex; and
- program taken.

HO4: There is no significant degree of variance on the students' performance in Business Mathematics when grouped according to:
- age;
- type of students; and
- secondary curriculum taken.

HO5: There is no significant degree of variance in the mastery level of the nine areas in Business Mathematics.

V. METHODOLOGY

The study employed quantitative research method using formative tests involving the nine main areas of Business Mathematics as reflected in the Course Syllabus (A.Y. 2020 – 2021). Purposive random sampling was also used since only those students taking Business Mathematics were selected. Documentary analysis was utilized in obtaining the Academic Performance of the students.

The study was conducted at Tagbilaran City College, located at Satellite Road, Dampas District, Tagbilaran City, Bohol. It is a Local College that started its operation last August 2019 and is offering B.S. Entrepreneurship, BS Office Administration, and B.S. Tourism Management.

There were 256 respondents comprising 126 (out of 210) BS Entrepreneurship and 130 (out of 218) BS Office Administration first-year students of Tagbilaran City College. Only non-ABM, old curriculum, and ALS graduates were included. It was ensured that they were taking up Business Mathematics in the first semester of AY 2020 – 2021. The respondents were randomly determined based on the submitted formative tests' answers in MS Teams App. Moreover, only those students who answered in the three formative tests were counted as respondents.

Three sets of multiple-choice item tests were crafted, all covering the nine areas of Business Mathematics. The first questionnaire included the students' profile as well. The crafted questionnaires undergone pilot testing and were validated using the Cronbach's Alpha Test of Reliability. Results of the Pilot tests were as follows: Test I = 0.69, Test II = 0.78, and Test III = 0.86.

A. Data Gathering Procedures

Permission was asked from the University of Bohol, Vice-President on Academics, the UB Dean of Graduate Studies, the Officer-in-charge of Tagbilaran City College, the Academic Program Head (BS OAd and BS En), and the Business Mathematics Instructors for the conduct of the study. The distribution of questionnaires was done online, using the MS Teams App. Students answered each

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questionnaire for one hour, after which submissions were received. Each response was acknowledged.

B. Ethical Considerations

The study undergone ethics review by the UB- REC. Permission letters were then sent to the TCC Administration for the gathering of data. The "Do–no harm" was upheld during the entire conduct of the research. The respondents were sent letters that contained the procedures and considerations taken in the conduct of the study. It also contained the guidelines in answering the questionnaire based on their knowledge of the topics in Business Mathematics, provided that anonymity and confidentiality shall be considered. Respondents were informed of their right to accept or reject their participation in the study voluntarily and stop answering the tool at any point if they feel their rights are being violated. The researcher's contact details were included in the letter of consent if they have issues during and after the data gathering. To avoid the spread of the Covid-19 virus, questionnaires were sent through MS Forms uploaded in the MS Teams App instead of a hardcopy.

C. Statistical Treatment

The profile of students was expressed in terms of simple percentage and ranking. Descriptive statistics like mean and standard deviation were used to present the students' academic performance. It was then analyzed based on the institutions' grading system as shown:

Grade	Interpretation
1.0 – 1.3	Outstanding
1.4 – 1.7	Very Satisfactory
1.8 – 2.1	Satisfactory
2.2 – 2.5	Fairly Satisfactory
2.6 – 3.0	Meets Expectation

Proficiency Level based on the results of the Formative Tests were solved using simple percentages and ranking and were interpreted as shown:

Percentage	Interpretation
90 & above	Exceptionally Proficient
80 - 89	Highly Proficient
70 - 79	Very Proficient
60 - 69	Basic Proficiency
50 - 59	Minimal Proficiency
49 and below	Beginning Proficiency

The mastery level in the nine areas of Business Mathematics were examined based on the following table:

Range	Mastery Level
90 & above	Highly Mastered
80 – 89	Mastered
70-79	Almost Mastered
60 – 69	Slightly Mastered
59 & below	Not Mastered

To determine if there is a significant relationship between students' profile and academic performance and students' profile and proficiency level, chi-square and Pearson Correlation were used. The obtained p-values were compared against a 0.05 level of significance.

Data on proficiency level and academic performance revealed a skewed distribution. Thus, the Spearman-rho Correlation was used to ascertain whether there is a significant degree of correlation between proficiency level and the students' academic performance. The obtained Spearman-rho ratio was checked at a 0.05 level of significance.

Mann-Whitney U test was used to determine the difference between the students' performance in Business Mathematics when grouped according to Sex and Course Taken.

To determine the variance in the students' performance in Business Mathematics when grouped according to Age, Type of Students, and Secondary Curriculum Taken, the Kruskal-Wallis Test was used.

Since most of the results of the Normality Test in the nine areas were normal, ANOVA was used to determine the variance in the mastery level of the nine areas in Business Mathematics. Furthermore, Scheffe's Test was done to determine the differences between the means.

VI. RESULTS AND DISCUSSIONS

Profile of the Students. The following tables show the profile of the respondents in terms of Age, Sex, Program, Type of Student, and Secondary Curriculum Taken.

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Table 1
Age of Students
N=256

Age	Frequency	Percent	Rank
18 – 21	235	91.8	1.0
22 – 25	12	4.7	2.0
26 – 29	5	2.0	3.0
30 and above	4	1.6	4.0
Total	**256**	**100.0**	

Table 2
Sex of Students
N=256

Sex	Frequency	Percent	Rank
Male	52	20.3	2.0
Female	204	79.7	1.0
Total	**256**	**100.0**	

Table 3
Program Taken by Students
N=256

Program	Frequency	Percent	Rank
BS Office Administration	130	50.8	1.0
BS Entrepreneurship	126	49.2	2.0
Total	**256**	**100.0**	

Table 4
Type of Students
N=256

Type of Student	Frequency	Percent	Rank
Full-time student	155	60.5	1.0
Part-time worker	82	32.0	2.0
Full-time worker	19	7.4	3.0
Total	**256**	**100.0**	

Table 5
Secondary Curriculum Taken by Students
N=256

Curriculum Graduated	Frequency	Percent	Rank
K-12	237	92.6	1.0
Old curriculum	15	5.9	2.0
ALS	4	1.6	3.0
Total	**256**	**100.0**	

Table 6
Academic Performance in Business Mathematics
N=256

Academic Performance	Range	Frequency	Percent	Rank
Meets expectation	2.6 – 3.0	22	8.6	4.0
Fairly Satisfactory	2.2 – 2.5	51	19.9	3.0
Satisfactory	1.8 – 2.1	121	47.3	1.0
Very Satisfactory	1.4 – 1.7	58	22.7	2.0
Outstanding	1.0 -1.3	4	1.6	5.0
Total		256	100.0	

	N	Minimum	Maximum	Mean	Std. Deviation
FINAL GRADE	**256**	**1.20**	**3.00**	**1.9973**	**0.34713**

Table 7
Proficiency Level
N=256

Proficiency Level	Percentage	Frequency	Percent	Rank
Beginning Proficiency	49 & below	106	41.4	1.0
Minimal Proficiency	50 – 59	60	23.4	2.0
Basic Proficiency	60 – 69	55	21.5	3.0
Very Proficient	70 – 79	26	10.2	4.0
Highly Proficient	80 – 89	6	2.3	5.0
Exceptionally Proficient	90 & above	3	1.2	6.0
Total		256	100.0	

	Minimum	Maximum	Mean	Std. Deviation
Formative Test Scores	**36.00**	**143.00**	**82.0781**	**20.67929**
Percentage	**24%**	**95.3%**	**54.75%**	
Proficiency Level	**Beginning Proficiency**	**Exceptionally Proficient**	**Minimal Proficiency**	

Parameter:

Scores	Percentage	Interpretation
74 and below	49 & below	Beginning Proficiency
75 – 89	50 – 59	Minimal Proficiency
90 – 104	60 – 69	Basic Proficiency
105 – 119	70 – 79	Very Proficient
120 – 134	80 – 89	Highly Proficient
135 – 150	90 & above	Exceptionally Proficient

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Table 9
Mastery Level in the Nine Areas of Business Mathematics
N = 256

Areas in BM	Test 1	Test 2	Test 3	Ave.	Mastery Level	Rank
Fractions, Decimals, Percent	57.73	65.63	58.20	60.52	Slightly Mastered	2
Ratio and Proportion	41.72	55.39	58.98	52.03	Not Mastered	5
Markup, Markdown, Discount	51.17	44.77	52.27	49.40	Not Mastered	6
Interest	43.98	43.44	47.19	44.87	Not Mastered	8
Mortgage and Amortization	59.77	43.20	44.61	49.19	Not Mastered	7
Commission	55.94	51.80	60.23	55.99	Not Mastered	4
Salaries and Wages	64.73	44.02	62.93	57.23	Not Mastered	3
Depreciation	37.89	44.30	41.41	41.20	Not Mastered	9
Analysis and Presentation of Data	86.95	76.25	76.17	79.79	Almost Mastered	1
Mean	**55.54**	**52.09**	**55.78**	**54.47**		
Mastery Level	*Not Mastered*	*Not Mastered*	*Not Mastered*	*Not Mastered*		

Parameter:

Weight	Range	Interpretation
5	90 & above	Highly Mastered
4	80 – 89	Mastered
3	70 – 79	Almost Mastered
2	60 – 69	Slightly Mastered
1	59 & below	Not Mastered

Out of the 256 first year college students, 235 (91.80%) aged 18 – 21. It is followed by 12 (4.69%) aged 22 – 25, five (1.95%) aged 26 – 29, and four (1.56%) aged 30 and above. This means that most students are aged 18 – 21. There were 204 (79.69%) females, and 52 (20.31%) males. This signifies that most of the respondents are female. Based on the program, 130 out of 256 (50.78%) students took BS Office Administration, and 126 out of 256 (49.22%) were taking BS Entrepreneurship. 155 (60.55%) were full-time students, 82 (32.03%) were part-time workers, and 19 (7.42%) were full-time workers. This implies that most of the students engage in full-time online learning. There were 237 (92.58%) who graduated in the K-12 Curriculum, 15 (5.86%) were products of the Old Curriculum, and 4 (1.56%) were from ALS. This implies that only a few students have not undergone Senior High School.

Academic Performance of the Students in Business Mathematics. The data revealed that the highest academic grade obtained by the students was 1.2, which means Outstanding, while the most minor grade obtained was 3.0, which means Meets Expectation. The average grade of the students was 1.997 and fell in the range of 1.8 – 2.1, which was generally interpreted as Satisfactory. This result suggests that students' academic performance is at an average level. This is supported by the study of Alpacion, et al. (2014), which revealed that the students' academic performance was satisfactory. However, this was negated by the findings of Andaya (2014), which showed that students' performance in Math courses is generally poor.

Proficiency Level. The result revealed that the minimum score obtained from the formative tests taken was 36, which was equivalent to 24% and was classified as Beginning Proficiency. The maximum score was at 143 or 95.3%, which falls under Exceptionally Proficient. The mean score was 82.0781, which falls between 50% – 59% and is interpreted as Minimal Proficiency. This means that majority of the students have little to no proficiency in Business Mathematics based on their scores in the Formative Tests taken. This supports the finding of Dhlamini&Luneta (2016) that students were not proficient in examination questions both for conceptual and procedural knowledge in Mathematics. Also, this is coinciding with Guita& Tan (2018), which stated that Filipinos perform below the standards.

Mastery Level in the Different Areas. The result showed that the area Presentation and Analysis of Data (A9) got the highest rank with the interpretation Almost Mastered at 79.79% Mastery Level. This implies that students had an almost sufficient understanding of analyzing and interpreting data from tables and graphs, fundamental to statistics. This is connected to Kaplan et al. (2014) that students have basic knowledge about the word statistics, but with varying depths of understanding in its content; but is negated by Elwan&Alwan (2013), stating the poor performance of students in statistics.

The second in rank is Fractions, Decimals, and Percentages (A1), which is Slightly Mastered at 60.52% Mastery Level. This means that fractions are quite mastered, but students need to improve performance in it. Yuanxin (2017) stated the importance and applications of fractions in everyday living, such as baking/cooking and estimating time. Thus, the area should be mastered by students.

Meanwhile, seven areas were Not Mastered based on the Mastery Level: Commission (57.23%), Salaries and Wages (55.99%), Ratio and Proportion (52.03%), Markup, Markdown, Discount (49.40%), Mortgage and Amortization (49.19%), Interest (44.87%), and Depreciation (41.20%). Among these areas, the area of Depreciation was the least mastered by students. This result suggests that the students performed at a below-average level. This result coincides with Andaya (2014) that students' performance in Math courses is generally poor. It also means that students have no mastery in seven out of nine areas in Business Mathematics. Thus, a remedial program is needed, especially in those areas where students show no mastery.

Relationship between Profile and Academic Performance. Results revealed an insignificant relationship between the students' Academic Performance in Business Mathematics and the age, type of student, and secondary curriculum taken by students. This means that students Age, Type, and Secondary Curriculum Taken cannot be associated with their Academic Performance in

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Mathematics. Meanwhile, a significant relationship was obtained between Sex and Academic Performance and Program and Academic Performance. This implies that Academic Performance can be associated with Sex and the Program of the students.

Summary on the Relationship between Profile and Academic Performance
N = 256

Groupings		P – Value	Result	Decision
Age	Academic Performance of the students in Business Math	0.091	Insignificant	Failed to Reject H_o
Sex	Academic Performance of the students in Business Math	0.020	Significant	Reject H_o
Program	Academic Performance of the students in Business Math	0.000	Significant	Reject H_o
Type of Student	Academic Performance of the students in Business Math	0.096	Insignificant	Failed to Reject H_o
Secondary Curriculum Taken	Academic Performance of the students in Business Math	0.143	Insignificant	Failed to Reject H_o

In terms of age, the findings of Owolabi&Etuk-Iren (2014) that students' ages are insignificant to performance in mathematics. On the other hand, Waldman and Avolio (2015) found a significant association of students' ages to mathematics performance. Johnson and Kuennen (2017), which states a positive association between sex and performance. Thein (2016) also supported this finding. However, Noureen& Sheikh (2016) contradicted the result and stated that sex has no relation to students' mathematics performance. Korhonen et al. (2014) stated a positive association between the students' program, and performance. This was further proven by Andaya (2014) that stated a positive correlation between the profile of students and academic achievement. Based on the type of student, Darolia et al. (2014) found that work cannot be associated with students' achievement. Byun (2014) and Wang (2010) also found no association between type of student and academic performance. On the contrary, Cinamon (2018) found that the freedom to choose the number of hours at work and the nature of work associates to positive performance. Similar findings were revealed by Triventi (2104), Richardson (2014), and Wenz and Yu (2010) that students' time and nature between work and study have an impact on their mathematics performance. Imam et al. (2014) that revealed no association between the academic performance of students who have graduated from the various curriculums. The result opposed the findings of Laging and Vobcamp (2017), which revealed that the type of school graduation is an essential determinant of mathematics performance.

Relationship between Profile and Proficiency Level. Results exposed a significant relationship between the Proficiency Level of the students and the Age, Program, and Type of Student. It implies that retention is affected by students' age (Waldman and Avolio, 2015). Students' proficiency level is also associated with the Program they have taken (Korhonen et al., 2014). The Proficiency Level was also due to the student's type, whether Full-time, Part-time Worker, or Full-time Worker (Cinamon, 2018).

On the contrary, an insignificant relationship was obtained between Sex and Proficiency Level, and Secondary Curriculum Taken and Proficiency Level. This implies that Academic Performance has no relationship to their sex and High School Curriculum Taken. These results are supported by Noureen& Sheikh (2016) studies that sex has no relation to students' mathematics performance and Imam et al. (2014), which revealed no association between the academic performance of students who have graduated from the various curriculums.

Summary on the Relationship between Profile and Proficiency Level
N = 256

Groupings		P–Value	Result	Decision
Age	Proficiency Level	0.011	Significant	Reject Ho
Sex	Proficiency Level	0.514	Insignificant	Failed to Reject Ho
Program	Proficiency Level	0.000	Significant	Reject Ho
Type of Student	Proficiency Level	0.038	Significant	Reject Ho
Secondary Curriculum Taken	Proficiency Level	0.134	Insignificant	Failed to Reject Ho

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Correlation between Proficiency Level and Academic Performance of the Students in Business Mathematics. The computed p-value, 0.000, is lesser than the 0.05 level of significance (2-tailed). This suggests rejection of the null hypothesis and denotes a significant degree of correlation between Proficiency Level and Academic Performance of the Students in Business Mathematics. The obtained r-value (-) 0.571 indicates a moderate negative correlation. The negative correlation implies that as students' grades decrease, the higher is their academic performance. Furthermore, it indicates that students with High Proficiency are likely to have High Academic Performance. In the same sense, it implies that students with Low Proficiency levels are also Low in Academic Performance.The correlation between proficiency level and academic performance was proven by the study of Guinocor (2020). In addition, the result supports the findings of Faber (2017) and Johnson and Kuennen (2017), which stated that obtaining high formative test results leads to higher grades. Thus, the students' Academic Performance signifies retention towards the topics tackled in the areas of Business Mathematics.

Correlation between Proficiency Level and Academic Performance
N = 256

Spearman's Rho		Proficiency Level	Academic Performance
Proficiency Level	Correlation Coefficient	1.000	-.571**
	Sig. (2-tailed)		0.000
	N	256	256
Academic Performance	Correlation Coefficient	-.571**	1.000
	Sig. (2-tailed)	0.000	
	N	256	256
P-value = 0.000			
Result: Significant			
Ho: Reject			

Performance of the Male and Female Students. The results revealed that the p-value on the academic performance of male and female students is 0.001, which is lesser than the 0.05 level of significance. Thus, rejecting the null hypothesis. It means a significant difference between the academic performance of the male and female students. It was also found that females have a lesser mean than males. Since tertiary grades indicate higher performance for lesser values, then females received higher grades than their male counterparts. Thus, females are better than males in terms of academic performance.

Difference between Academic Performance and Proficiency Level of the Male and Female Students
N = 256

	Sex	N	Mean	Mean Rank	Sum of Ranks
Academic Performance	Male	52	2.15	158.66	8250.50
	Female	204	1.96	120.81	24645.50
	Total	256			
P – value = 0.001					
Result: Significant					
Ho: Reject					
Proficiency Level	Male	52	77.10	113.04	5878.00
	Female	204	83.35	132.44	27018.00
	Total	256			
P – value = 0.092					
Result: Insignificant					
Ho: Failed to Reject					

The result supports Bolarinwa et al. (2016), which revealed that female students performed better than male students in Business Mathematics. However, Thein (2016) concluded that boys and girls are performing equally in mathematics based on various aspects. On the other hand, the obtained value on the proficiency level of the male and female students is 0.092, which is greater than 0.05. This implies that the null hypothesis cannot be rejected, and no significant difference is found in the proficiency level of male and female students. This result was supported by Thein (2016) through tests to measure Math Performance between male and female students, which obtained no significant difference in the performance of the male and female students.

Performance of the BS OAd and BS En Students. The result showed that the obtained value for both Academic Performance and Proficiency Level of the two programs is 0.000, which is smaller than the 0.05 level of significance.

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This indicates the rejection of the null hypotheses and that a significant difference is found in both the Academic Performance and Proficiency Level of the BS OAd and BS En students. Since tertiary grades indicate lesser performance for bigger figures, it revealed that the BS Office Administration students had obtained better grades than the BS Entrepreneurship students. In connection, BS OAd students are more proficient than BS En students. This implies further that BS OAd students have better retention than the BS En students. Bhowmik (2017) supported this, which found that marketing students perform poorly in arithmetic based on examination results.

Difference between Academic Performance and Proficiency Level of the BS OAd and BS En Students
N = 256

	Program	N	Mean	Mean Rank	Sum of Ranks
Academic Performance	BS Office Administration	130	1.87	101.68	13218.50
	BS Entrepreneurship	126	2.13	156.17	19677.50
	Total	256			
P – value = 0.000 Result: Significant Ho: Reject					
Proficiency Level	BS Office Administration	130	86.75	145.10	18863.00
	BS Entrepreneurship	126	77.26	111.37	14033.00
	Total	256			
P – value = 0.000 Result: Significant Ho: Reject					

Variance on Students' Performance in Business Mathematics when Grouped According to Age, Type of Student, and Secondary Curriculum Taken. The results revealed that there is no significant variance in Students' Performance when grouped according to Age. Thus, no matter how young or old a student is, performance does not vary. This was found to be in congruence with the findings of Owolabi&Etuk-Iren (2014) that students' ages are insignificant to performance in mathematics.

On the contrary, a significant variance was found in Students' Performance when grouped according to the Type of Student and Secondary Curriculum Taken. This implies that there is variation in mathematics performance among students and the curriculum taken in high school. Garbo et al. (2019) supported this, which stated that the type of student and the curriculum taken impact Business Mathematics' performance.

Summary of Results in Variance on the Students' Performance when Grouped According to Age, Type of Student, and Secondary Curriculum Taken
N = 256

Variance between		P - Value	Result	Decision
Age	Academic Performance	0.105	Insignificant	Failed to Reject Ho
	Proficiency Level	0.129	Insignificant	Failed to Reject Ho
Type of Student	Academic Performance	0.003	Significant	Reject Ho
	Proficiency Level	0.000	Significant	Reject Ho
Secondary Curriculum Taken	Academic Performance	0.043	Significant	Reject Ho
	Proficiency Level	0.005	Significant	Reject Ho

Variance in the Mastery Level of the Nine Areas in Business Mathematics. Results revealed that the f-value of 8.448 with a p-value 0.000 is lesser than the 0.05 level of confidence. This implies the rejection of the null hypothesis and concludes a significant degree of variance among the means on the Mastery Level in the Nine Areas of Business Mathematics. Furthermore, Post hoc Test (Scheffe's) was done to locate the areas of differences among the means.

Based on the results, the following show a significant degree of variance among the means: Area 2 (Markup, Markdown, Discount) and Area 9 (Analysis and Presentation of Data), Area 3 (Ratio and Proportion), and Area 9 (Analysis and Presentation of Data), Area 4 (Interest) and Area 9 (Analysis and Presentation of Data), Area 5 (Commission) and Area 9 (Analysis and Presentation of Data, Area 8 (Depreciation) and Area 9 (Analysis and Presentation of Data), and vice versa. The Analysis and Presentation of Data (Area 9) was determined to have the majority of mean differences with other areas.

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This is because the area with the highest mean is expected to have a variance towards the area/s with the lowest means. On the other hand, the unmentioned areas were found to have insignificant differences in the means. This is because these areas were similar in terms of Mastery Level (Not Mastered).

VII. CONCLUSIONS

Based on the findings of the study, the researcher arrived at the following conclusions:

- The majority of the respondents in this study are aged 18 – 21 and are females. Most students are taking BS Office Administration and are full–time students. In addition, most of these students were graduates of the K – 12 Curriculum.
- Students' average grade was 1.997, and it is generally interpreted as Satisfactory. This means that students perform at an average level in terms of Academic Performance in Business Mathematics.
- The students' Proficiency Level based on the results of the Formatives Tests Taken is interpreted as Minimal Proficiency with a mean score of 82.0781 (54.7%). This implies that the majority of students have little to no proficiency in Business Mathematics based on their scores in the Formative Tests taken.
- The area Presentation and Analysis of Data was Almost Mastered and were the highest among the nine areas. Fractions, Decimals, Percent was Slightly Mastered. The majority of students' lack mastery in seven out of nine areas in Business Mathematics within which, Depreciation is the least mastered.
- There is an insignificant relationship between Age and academic Performance. This denotes that Age cannot be associated with Academic Performance in Business Mathematics.
- A significant relationship exists between sex and academic performance. Sex can be associated with the Academic Performance of the Students in Business Mathematics.
- There is a significant relationship between the program and academic performance. Program taken can be associated with Academic Performance in Business Mathematics.
- An insignificant relationship exists between the type of student and academic performance. Type of student cannot be associated with Academic Performance in Business Mathematics.
- There is no significant relationship between secondary curriculum taken and academic performance. This denotes that secondary curriculum taken cannot be associated with Academic Performance in Business Mathematics.
- A significant relationship exists between Age and proficiency level. Age can be associated with Proficiency Level in the Formative Tests taken.
- There is no significant relationship between sex and proficiency level. This denotes that sex cannot be associated with Proficiency Level in the Formative Tests taken.
- There is a significant relationship between program and proficiency level. Program taken can be associated with Proficiency Level in the Formative Tests taken.
- There is a significant relationship between the type of student and proficiency level. Type of student can be associated with Proficiency Level in the Formative Tests taken.
- There is no significant relationship between secondary curriculum taken and proficiency level. Secondary Curriculum Taken cannot be associated with Proficiency Level in the Formative Tests taken.
- There is a significant negative moderate correlation between Proficiency Level and Academic Performance in Business Mathematics. Since tertiary grades indicate higher performance for lesser values, students with small grade values have higher proficiency and vice versa.
- There is a significant difference between the academic performance of the male and female students. Females overpowered their male counterparts. However, there is no significant difference between the proficiency level of the male and female students, which means male and female students have the same level of proficiency.
- There exists a significant difference between the academic performance and proficiency level of the BS OAd and BS En students. BS OAd students overpowered the BS En students both in Academic Performance and Proficiency Level.
- There is no significant variance in the academic performance and proficiency level of the students when grouped according to Age. Academic Performance and Proficiency Level do not vary among different age groups.
- A significant degree of variance exists in the academic performance and proficiency level among the three types of students. Full-time workers obtain the highest academic grades and proficiency level compared to Part-time Workers and Full-time Students, which means they were able to balance work and study.
- There is a significant variance between the academic performance and proficiency level of the students who graduated from different curriculums. Old curriculum graduates dominated in both Academic Performance and Proficiency Level in Business Mathematics.
- There is a significant variance on the Mastery Level in the nine areas of Business Mathematics. Furthermore, the multiple comparisons using Scheffe's Test show significant variance in the means on the area Analysis and Presentation of Data to Markup, Markdown, Discount; Ratio and Proportion; Interest; Commission; and Depreciation.

VIII. RECOMMENDATIONS

The researcher has come up with the following plausible recommendations based on the findings and conclusions of the study.

- Remedial classes in mathematics should be strengthened to address the academic needs of low-performing students.
- The timeframe for the various areas in Business Mathematics should be adjusted to address those areas with no mastery, with the Program Head for BS Entrepreneurship and BS Office Administration.
- The institutions' guidance center is encouraged to continue counseling activities that develop students' stability in all courses with the approval of the Program Heads in the corresponding programs.
- Mathematics instructors should plan strategies to increase students' Performance in Mathematics, focusing on retention and mastery.
- Regular feedbacking and consultation between the subject-teacher and students may intensify to improve collaboration regarding academic Performance and proficiency level of those struggling in mathematics. BS Entrepreneurship students should know the solutions to problems given and be aware of word clues that may help them understand the subject.
- It is suggested that the findings and proposed remedial program of this study be presented and implemented to school authorities, teachers, parents, and students for information, reflection, and decision-making.

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