Correlation between Student Entrance Exam Results and Academic Performance: Case of a College in a Philippine University

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Abstract: This preliminary study was conducted to determine a possible correlation between the entrance exam results of students under the College of Computing and Information Technologies (CCIT) – National University, Manila, Philippines, and their accumulated GWA and the number of units earned. A total of 213 student entrance exam results from 2012 to 2015 were used as data. The entrance exam results were divided into two sections as there was the old and new instrument used. The old instrument consisted of three areas namely, General Information, Mental Alertness, and Comprehension, whereas, the new instrument which was implemented in 2015 includes four areas namely, English, Math, Science, and Aptitude. Simple linear regression and Pearson Correlation using Stata were used to predict whether the academic performance of the students can be predicted through the entrance exam results and whether an association exists between the two variables. The test revealed that both instruments could statistically significantly predict the GWA and units earned by the examinees. The Pearson's Correlation, however, showed that the new instrument of the entrance exam had a higher correlation about the GWA of the examinees as opposed to the old instrument. It was also observed that in the new instrument, English and Science could statistically significantly predict the GWA of the examinees. Though it is thought that computing is heavy in math and that requires logic, the results showed that math is not a significant predictor for their GWA. Other results and recommendations are discussed in the paper.

Keywords: Entrance exam; academic performance; correlation,

1. INTRODUCTION

College admission exams are standardized examinations that determine students' chance of pursuing a degree in an academic institution (Bai, Chi, & Qian, 2014). Studies have been conducted to understand whether the result of admission exams would mean success in completing their degree. Some studies have shown that a good admission test can predict the students' academic ability to succeed in his/her chosen program. Studies include entrance exams in the medical field (Gómez-López, Rosales-Gracia, Marín-Solórzano, & Josefina Guzmán-Acuña, 2012; Murray, Merriman, & Adamson, 2008), business administration and management (Sebastian & Sebastian, 2014 ; Sulphey, Al-Kahtani, & Syed, 2018), Social Science, and Engineering (Sulphey, Al-Kahtani, & Syed, 2018; Krishnakumar & Dutt, 2017). Understanding entrance exam results about the students' academic

performance could help councilors develop screening procedures to guide and advice examinees as to the program that would suit them.

Though several studies have been undertaken to study the correlation between the student entrance exam and their academic performance, it seemed that results vary particularly in developing countries (Silfverberg & Orbeta, 2014). In the study of Birari and Randhawa (2014), they found out that MBA entrance exam has a very weak correlation with regards their academic standing in their graduate studies (Birari & Randhawa, 2014). To date, there seem to be no studies that have been made in the field of computing that explores a possible correlation between an entrance exam and their academic performance. Subsequently, no studies have been identified that seeks to uncover which category of the exam (e.g., Math, Science, English, among others) can predict the performance of the students.

It is now the role of the present study to determine whether the student entrance examination of National University-Manila is directly correlated with the students' academic performance of the College of Computing and Information Technologies. Since there were two instruments (old and new) used for the entrance exams, this paper will produce separate outputs for the two instruments.

2. METHODOLOGY

This study was conducted through a quantitative approach employing Simple Linear Regression and Pearson Correlation. The statistical techniques were used to determine whether the academic performance of the students can be predicted through the entrance exam results. Subsequently, it explores whether an association exists between the two variables. Stata 11 was used for the application of the statistical techniques.

The entrance exam results were taken from the University's Admissions Office. A letter was sent to the Admissions Office requesting the needed data. While the request was favorably granted, names were excluded in compliance with data privacy. Data include records from the academic year 2012 - 2013 to 2014 – 2015. A total of 111 entrance exam results were retrieved from 2012 – 2014 (1st semester) which makes use of the old instrument. For the 2nd semester of 2014 to 2015, a total of 120 exam results were retrieved utilizing the new entrance exam instrument. Table 1 shows the breakdown of the number of entrance exam results.

The GWA of the students, on the other hand, were retrieved from the University's Office of the Registrar and was manually encoded in MS Excel with their names withheld. Data cleaning was done by removing students who did not continue to pursue the BSIT or BSCS program. Additionally, outliers were removed by excluding data with GWA of 0.00, and those whose Credit units earned is less than 10. The 0.00 grade or the units earned of less than ten might mean that the student did not finish his or her first sem in National University. Data with students greater than the prescribed number

of units in the program were also removed. This might be due to encoding problems.

Table 1. Number of Entrance Exam Results

Year	Program	Number Entrance Exam Takers
2012 – 2014 (1st Sem)	BSIT	88
	BSCS	12
2014 (2nd Sem) – 2015	BSIT	86
	BSCS	17
	BSCS-DF	10

The instruments (old and new) for the entrance exam were broken down into different categories. Table II shows the categories.

Table 2. Entrance Exam Categories

Instrument	Categories	Year of Implementation
Old	General Information (GI)	2012 – 2014 (1st Sem)
	Mental Alertness (MA)	
	Comprehension (C)	
New	English	2014 (2nd Sem) – 2015
	Math	
	Science	
	Aptitude	

3. RESULTS AND DISCUSSIONS

This section provides the results of the statistical techniques used in the data. The first half focused on the old instrument while the other half concentrated on the new instrument.

3.1 Old Instrument

Looking at the result of the old instrument, the category Mental Alertness (MA) had the highest mean followed by Comprehension and General Information.

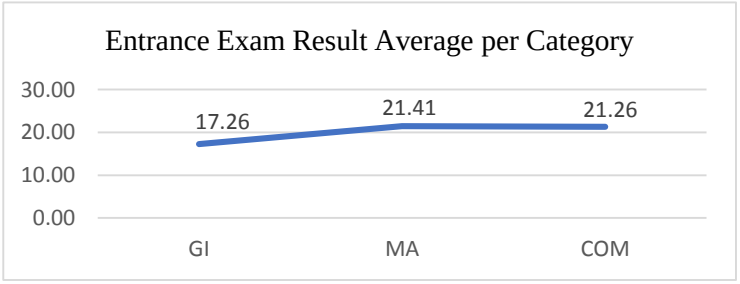

Fig 1. Entrance Exam ($\bar{x}$) per Category

Figure 2, on the other hand, reveals the means of the categories for both programs. The result shows that there is a difference with regards the results of Mental Alertness mean score. The average is higher for the BSIT examinees than that of the BSCS. However, it is not fully conclusive as the entrance exam results used in the study for the BSCS examinees were only 12 as opposed to the 88 BSIT examinees. This is only around 14% of the total population. What is conclusive on the result is that the General Information seemed to be the most difficult category to answer.

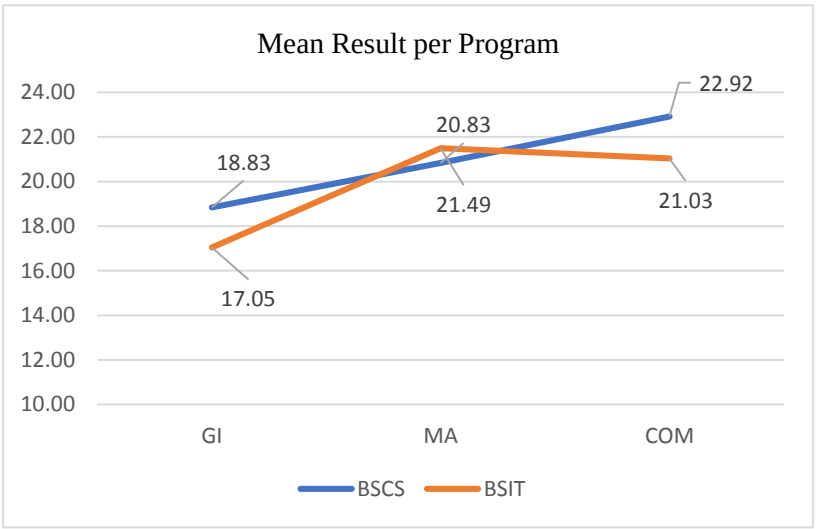

Fig 2. Mean ($\bar{x}$) Test Scores of the Three Categories per Program under the Old Instrument

To determine whether the Entrance Exam Results of the learners is a predictor for their GWA, a simple linear regression was used. The test revealed that it is statistically significant with a coefficient of 0.009 *(F[1,98]=11.24, p=0.001)*. The same test was done to determine whether each of the categories of the exam is a predictor for the learner's GWA. The result is shown in Table 3.

Table 3. Multiple Regression Result of the different categories of the Entrance Exam Result

Category	Coef.	p
General Information (GI)	0.007	0.465
Mental Alertness (MA)	0.008	0.053
Comprehension (C)	0.006	0.619

Looking at the results, all the three categories that fall under the entrance exam instrument are not statistically significant. However, as previously mentioned, the overall result of the entrance exam can be considered as a predictor for the GWA of the learners.

Subsequently, the scatter plot (Figure 3) revealed a positive relationship between the students' entrance exam result with their accumulated GWA.

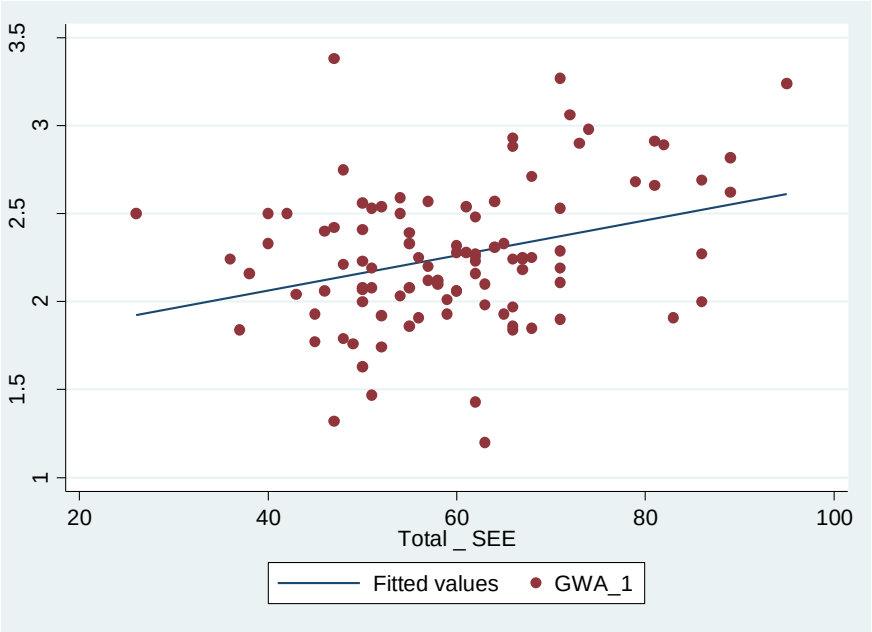

Fig 3. Scatter plot of GWA and the Entrance Exam Result.

To test the strength of the relationship between the two variables, Pearson's Correlation was used. The result yielded a moderate correlation between the Entrance Exam Result and the GWA of the learners, $r = 0.320$, $p = 0.001$, with Entrance Exam Result explaining 10% the variation in the GWA of the students. The p-value denotes that the result is statically significant.

The next test focused on whether the scores of the entrance exam is a predictor of the accumulated number of units obtained by the students. For this test; regression was again used. The result yielded a positive relationship between the entrance exam score and the number of units earned $(F[1,98] = 7.17, p=0.009)$. The p-value is less than 0.05 which makes it statistically significant with a coefficient of 1.08. The coefficient value would mean that a low score in the entrance exam would merit low accumulated number of units. This could mean that students may drop-out of the program or may repeat subjects which would prohibit them from enrolling subjects with pre-

requisite course. Hence, the low accumulated number of units earned. The Pearson's correlation also tells a positive moderate correlation between the two variables *(r=0.2610, p=0.008).*

3.2 New Instrument

The same tests were conducted for the new instrument. As previously mentioned, the new instrument consisted of four categories namely, English, Math, Science, and Aptitude. Figure 4 shows the average scores under the four categories

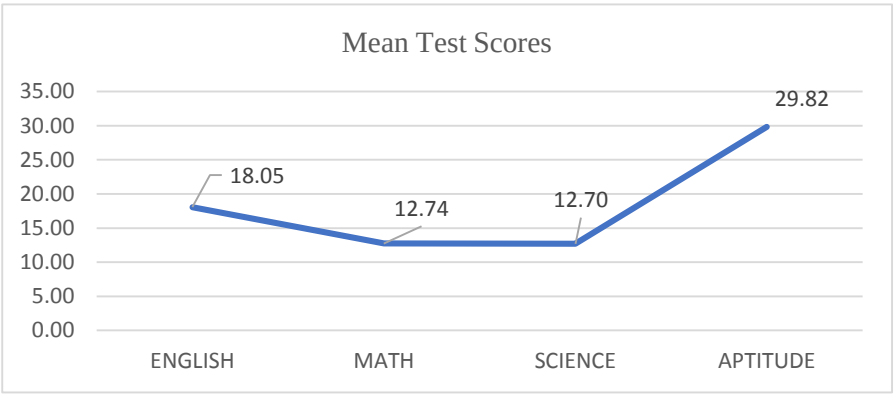

Fig 4. Mean Test Scores of the Four Categories under the New Instrument

As seen in Figure 4, the highest average means come from the Aptitude test followed by English, Math, with Science yielding as the lowest. Science, however, is only 0.4 away from the next lowest score.

Looking at the difference between the average scores of the two programs (BSCS and BSIT), both seemed to reveal the same pattern with examinees from the BSCS yielding higher scores (see figure 5)

However, it can be observed that for the BSIT examinees, the lowest average obtained was from the Math category, whereas, for the BSCS examinees, the lowest average score is from the Science category. The result could indicate that Science and Math are the two most difficult categories under the new Instrument. This could be validated by comparing the results of the entrance exams of other programs in the University.

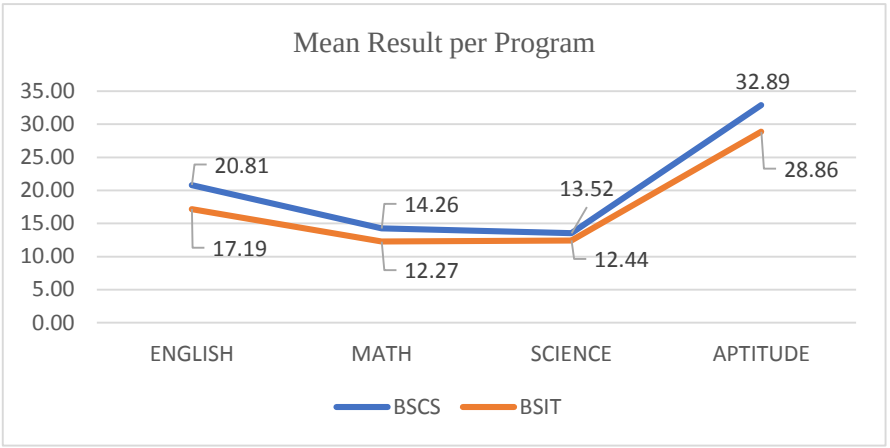

Fig 5. Mean Test Scores of the Four Categories per Program

The linear regression was again used to test whether the new instrument can also serve as a predictor for the GWA, The test revealed that the over-all entrance exam test result could statistically significantly predict the GWA of the students *(F[1,110] = 14.96, p=0.000) with a coefficient of (b) 0.012*. The next test determined which of the four categories statistically predicted the GWA using multiple regression. Table 4 shows the results.

Table 4. Multiple Regression Result of the different categories of the Entrance Exam Result

Category	**Coef. (b)**	**p**
English	0.021	0.035
Math	0.000	0.982
Science	0.036	0.009
Aptitude	0.002	0.689

From the result, it can be observed that English and Science can statistically significantly predict the GWA of the examinees. Though it is thought that computing is heavy in math and that it requires logic, the results showed that math is not a significant predictor for their GWA. This could mean that students who excel in English and Science in the student entrance exam are those who would get better grades. However, in a study conducted by Balmes (2017) and Duran (2016) which determined a possible correlation between grades in math and programming courses among BSCS students, revealed that both are significantly correlated. Duran suggested that the result in the mathematics exam in the College Admission Test should be the basis for admission for the BSCS program. The result of the present study somehow contradicts the previous study as Math do not predict the performance of the students of CCIT.

With regard to the scatter plot, one can observe a slight positive relationship between the overall result of the entrance exam and the GWA.

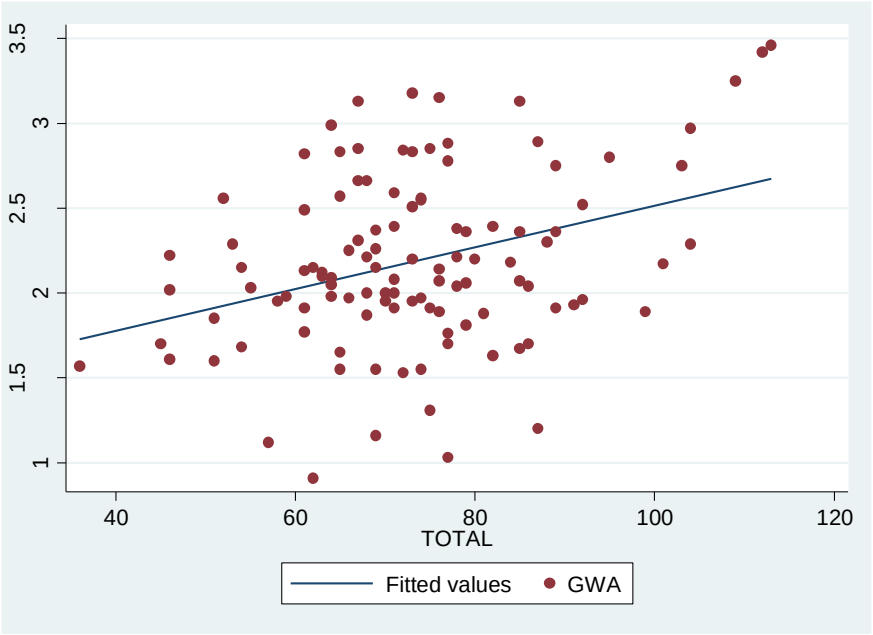

Fig 6. Scatterplot between the Entrance Exam Results and the GWA

To determine exactly the relationship between the overall score of the entrance exam and the GWA, Pearson's Correlation was again utilized. The result also yielded a moderate correlation, *r = 0.3460, p = 0.000.* Comparing with the result of the old instrument, it can be suggested that the new instrument has a higher positive correlation with regards the GWA as opposed to the old instrument. However, caution is made for this generalization as the number of the examinees under the old instrument are quite a few.

For the number of units obtained, the linear regression revealed a positive relationship between the entrance exam score and the number of units earned *(F[1,110] = 16.76, p=0.000)* with a coefficient of 1.07. The overall score of the entrance exams of the students using the new instrument can also statistically significantly predict the total number of units earned. Comparing with the old instrument, it seemed that there is only 0.01 difference. Applying the Pearson's correlation, the test also revealed a moderate correlation (r=0.3637, p=0.000). Again, the correlation is higher than the of the old instrument.

4. CONCLUSION

This preliminary study was conducted to determine a possible correlation between the students' entrance exam results from the College of Computing and Information Technologies (CCIT) – National University and their accumulated GWA and units earned. Looking at the results of the two tests (old and new instrument), it revealed that both instruments could statistically significantly predict the GWA and units earned by the examinees. However, the data presented in the study may not fully reflect the entire population of the College as the data collected is not complete. Starting in 2012, the college has gathered around four to five sections with a total number of forty (40) students each. But due to some filing issues in the University's Office of Admission, not all entrance exam results were kept correctly. Hence, the need to save and protect succeeding entrance exam results to validate the new entrance exam instrument further.

It was also observed that results for the new instrument had a higher correlation with regards the GWA and the number of units earned as opposed to the old instrument. English and Science can statistically significantly predict the academic performance of the students. This is very interesting since the field of computing is heavy in Math. As previously mentioned, studies have shown that Math scores are directly correlated to programming exam scores among BSCS students. One contributory factor for the discrepancy could be due to the general courses in the college. A more significant chunk of the courses in the curriculum of the CS and IT program are spread out to the General Education Courses. Hence, a need to review the entrance exam instrument that would help balance the result. The authors suggest excluding aptitude test in the admission exam for CCIT as it is not directly correlated with the students GWA. Additionally, a separate study on math exam results and their programming courses grade should also be conducted to determine whether relationship occurs. It is only through this study that we can conclude if math is still necessary for the admission test of the college.

This preliminary study is the first to identify which categories of the admission test is directly correlated with the student's performance in CCIT. A comparison between the results of this study with similar studies from other Colleges of the University is recommended to determine the features of the entrance exam results of those who succeed in their respective program. This could serve as a guide to entrance examinees choose which course to take based on the outcome of the entrance exam to help reduce possible drop-out.

The next study would focus on determining whether de-loading of subjects provide necessary aid for students to cope-up with their program in the College of Computing and Information Technologies.

Additionally, other data of the examinees that can still be retrieved from the registrar's repository (e.g., high school grades, gender, economic background) can be subjected to data mining. The use of data mining can help predict examinees who are likely to discontinue the program or finish

the program on time. Data mining has been used to predict whether students will pass or fail exams based on certain extracted features (Kumar Yadav & Pal, 2012). It is also the aim of the researchers to do data mining to help identify which students need immediate intervention to help them succeed in the program.

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