# Teacher Education Admission Test Results in Mathematics: Basis for Pedagogical Enhancement

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***Abstract –*** *College admission test is not an uncommon occurrence in an entering to college freshman's journey. It is a measure of his/her aptitude and a guage whether he/she will be admitted in a higher education institution. Guimaras State College (GSC) conducts admission test yearly to all its incoming freshmen. This study looked into the admission test performance of all the 90 aspiring freshmen to the College of Teacher Education of the GSC-Salvador campus, specifically looking into the mathematics outcome. It is aimed to determine whether pedagogical enhancement in mathematics is necessary. The study employed a descriptive methodology and utilized mean, percentage and rank as its statistical tool. The 90 aspiring freshmen was composed of all the test-takers from 2015 to 2019 which is inclusive of four academic years. The office of the Guidance Counselor provided the data which was used in this study. It was found out in these data that the takers performed as "poor" in their mathematics questions, which was composed of basic mathematics, algebra, geometry, trigonometry and statistics. It also showed that the students performed best in trigonometry and poor in basic mathematics. There were salient topics identified in each mathematics area where the students performed either good or poor. The findings showed the need to improve the students' mathematical skills. Thus, the author recommended that pedagogical enhancement be employed to improve student learning and performance. Bridging courses may also be offered to further students' knowledge and mathematical skills.*

***Keywords*** *– Guimaras State College, mathematics performance, pedagogical enhancement, achievement test, Buenavista*

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## INTRODUCTION

In the Philippine setting, a graduating high school student prepares for one of his anticipated activities. College or University admission test is one of the most anticipated activity of the graduating high school students especially in the Philippines. Preparation for the college examinations are popular that the parents even pay for review centers to secure their children's chance to be accepted in a prestigious university. In theory, all students in the Philippines can gain access to higher education if they meet the admission criteria most especially if they meet the tuition and living cost. However, admission requirements remain dependent upon individual higher education institutions (HEIs). Entrance to HEIs is dependent on the possession of a high school certificate of graduation and in many HEIs the result of their own entrance examination [1].

In the Philippines, admission to public universities can be very competitive. Universities and colleges, maintain their own admissions criteria, which may include a school administered admissions test, secondary school grades, an interview, and a medical examination. Admission test score is one significant metric in the selection of the students who will be successful in their later professional career and those candidates who are able to study diligently enough to pass all the study requirements. In that sense the selection procedure at admission is selecting in the best candidates [2].

On the other hand, most universities and colleges use high school grade point average instead of the admission test scores to decide which students to accept in an attempt to find the most dedicated students. The basic assumption is that a high school student with a high grade point average will achieve high grades at universities [3].

Senator Edgardo Angara lamented that the decline of science and math skills of Filipinos is part of the overall decline of education in the country. He pointed out that in the National Achievement Tests, for example, 97.9 % of high school students failed, and the average score for English was 50% [4]. In the Trends in the International Math and Science Study or TIMMS,

administered every four years by the International Association for the Evaluation of Education Achievement (IAEEA) based in Boston College, USA., the performance of the Philippines continues to be poor: 41st in Math and 42nd in Science, out of 42 countries, in the High School level [5].

Guimaras State College (GSC) is conducting entrance examination to the incoming freshmen and such includes the item in Mathematics. Mathematics plays an instrumental role in the development of all scientific discipline. As distinct as it is, mathematics is thought of as a fundamental part of any curriculum [6]. Therefore, a solid background in mathematics is important for successful participation in all programs of Guimaras State College. And all of our students should prove they have attained a minimum level in mathematics through their entrance exam results.

Pedagogical enhancement then can be enforced if the results of their admission examination in Mathematics is low. Analysis of such results is empirical so measures can be affected if found to be really needed. It is on this ground that this study is conducted.

## OBJECTIVES OF THE STUDY

This study was conducted to determine the GSC Teacher Education admission test results in mathematics as basis for pedagogical enhancement during the AY 2015-2019 at Guimaras State College, Buenavista, Guimaras, Philippines.

Specifically, this study was conducted to seek answer to the questions (a) what is the performance of the incoming freshmen students of College of Teacher Education on mathematics admission test for the last four years; (b) what is performance of the freshmen students on areas of mathematics when grouped as whole; (c) what is the performance of the freshmen students on areas of mathematics when categorized as to basic mathematics, algebra, geometry, trigonometry, statistics, and calculus; and (d) what pedagogical enhancement can be done to students who are taking Math courses based from their entrance exam results.

### Research Paradigm

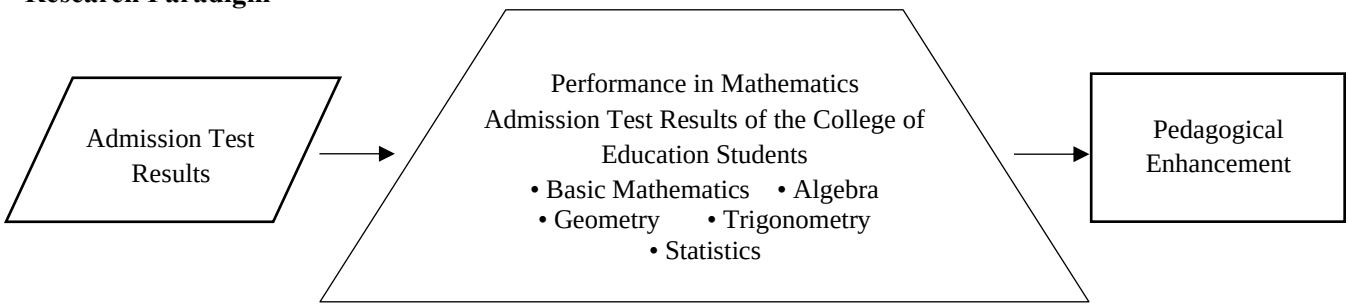


Figure 1. Schematic Diagram of the Admission Test Result of the Incoming Freshmen Students of the College of Teacher Education

## MATERIALS AND METHODS

### Research Design

This study utilized descriptive research design. The data used were secondary data taken from the office of the Guidance Counselor. The respondents of the study were all the 90 incoming freshmen students of College of Teacher Education of Guimaras State College Salvador Campus from Academic Year 2015-2019.

### Research Locale

The study was conducted in the Salvador Campus of the Guimaras State College (GSC), located in the Province of Guimaras, Philippines.

### Sampling Procedure

Utilizing a purposive sampling method, the subjects of the study were all of the ninety (90) incoming freshmen students who took the College admission test for the academic years 2015 – 2019 and enrolled accordingly to the College of Teacher Education.

### Data Collection

The data were lifted from the records of GSC's Office of the Guidance Counselor. The data in focus was the admission test given to the ninety (90) incoming freshmen, which involved 30 mathematics questions.

### Data Analysis

Statistical tools used were frequency, percentage, mean, standard deviation, and rank. A trend analysis was also used to present the scenario in the inclusive years of the study.

## RESULTS AND DISCUSSION

Figure 2. **Performance of the incoming freshmen students of the College of Teacher Education from the last four years**

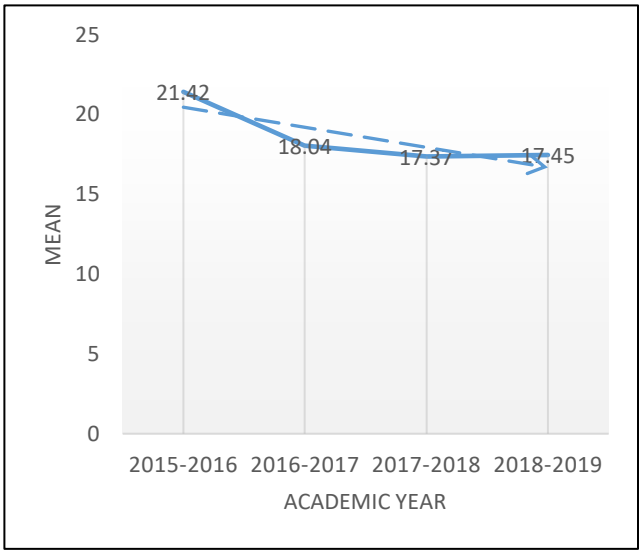


Figure 2 presents the performance of the incoming freshmen students of college of teacher education on the mathematics admission test result for the last four years. Result revealed that Academic Year 2015-2016 got the highest test result (M=21.42) while Academic Year 2017-2018 got the lowest test result (M=17.37).

Figure 2 shows a downtrend in the mathematics performance means of incoming college freshmen, which is reflective of the worldwide situation for the past two decades [7]. Thus, Philippines is not alone in this scenario of decline in mathematics performance of its students [8].

Table 1. **Performance of the Incoming Freshmen Student of College of Teacher Education on Areas of Mathematics When Grouped as a Whole**

| Areas of Mathematics | Percentage | Rank |
|---|---|---|
| Trigonometry | 66.67 | 1 |
| Geometry | 49.05 | 2 |
| Statistics | 47.41 | 3 |
| Algebra | 46.85 | 4 |
| Basic Mathematics | 45.71 | 5 |

Table 1 presents the performance of the incoming freshmen student of college of teacher education on areas of mathematics when grouped as a whole. Result revealed that the trigonometry got the highest percentage of 66.67 among the areas of mathematics. Followed by geometry (49.05%), Statistics (47.41%), and Algebra (46.85%). However, Basic Mathematics got the lowest test result of 45.43%.

Above table is reflective of the Organization for Economic Cooperation and Development's (OECD) Programme for International Student Assessment (PISA) report in 2015 that less than 50%, specifically, only more than 1 of 4 students do well in mathematics [9]. One factor being looked at that influences this outcome is the teacher-led instruction, which is being considered to make the students be passive learners [10], [11].

Table 2. **Performance of the Incoming Freshmen Student of College of Teacher Education on Areas of Mathematics in the subject Basic Mathematics**

| Test Items | % | SD |
|---|---|---|
| 1. 20% of 600 is ___? | 85.56 | 0.05 |
| 14. What is the Roman symbol for 239? | 80.00 | 0.10 |
| 16. Reduce 12/48 to the lowest term. | 50.00 | 0.09 |
| 18. If the sum of a certain number and 5 is divided by 3, the quotient is 3. What is the number? | 43.33 | 0.18 |
| 13. A bank imposed 0.08% penalty on a borrower for delayed payment for his loan. If the borrower paid P128.40 as penalty, how much was his loan? | 28.89 | 0.06 |
| 9. Which decimal notation is equal to 3/5? | 18.89 | 0.11 |
| 8. The least common multiple of 12, 20, 42, and 56 is _____ . | 13.33 | 0.11 |
| Overall Percentage | 45.71 | |

*Leged: % - Percentage of students who got the correct answer; SD- Standard Deviation*

Table 2 presents the performance of the incoming freshmen student of college of teacher education on areas of mathematics when grouped according to basic mathematics. Result revealed that 85% of the students got the correct score on item no. 1 that rank first. Followed by item no. 14, that rank second, item no.16, that rank third. However, item no. 8 got the lowest rank with 13% of correct answer. The students find the question on percentage to be easy on a straight application, however, they struggled when the question is tweaked, as in item no. 13. The data also shows that 2 of 10 students can handle decimals, and only 1 of 10 can recall the topic on multiples and factors.

According to Hudson [12], misunderstanding, or lack, of the basic concepts creates the students struggle in mathematics and remediation is apparent [13]. Standard deviations of the questions show

cohesiveness since they are only in the area of 10%, except for question number 18, which has a Standard deviation of 0.18.

Table 3 presents the performance of the incoming freshmen student of college of teacher education on areas of mathematics when grouped according to algebra.

Table 3. **Performance of the Incoming Freshmen Student of College of Teacher Education on Areas of Mathematics when grouped according to Algebra**

| Test Items | % | SD |
|---|---|---|
| 17. Find the $14^{th}$ term in the sequence 5, 7, 9, 11. | 86.67 | 0.20 |
| 5. The minicab can carry at most twelve persons. Which is true? | 60.00 | 0.14 |
| 22. In the expression $2x^2$-3x-1, its leading term is _____. | 51.11 | 0.13 |
| 6. Which of the following integers is divisible by 3? | 50.00 | 0.14 |
| 23. The sum of the expression 4x+2y-7 and 5x+5z+3? | 48.89 | 0.04 |
| 21. What property is shown if 2+3 = 3+2? | 46.67 | 0.05 |
| 19. What is the binomial factor of the expression $8x^3$-27? | 45.56 | 0.11 |
| 20. $(-100)^0$ when simplified is _____? | 38.89 | 0.10 |
| 30. A well defined collection of definite, aggregate, and distinct objects or things. | 38.89 | 0.14 |
| 29. What value of x will make 4x<5 a false statement? | 35.56 | 0.03 |
| 10. Multiply (3a+5b) by (2a-4b). | 33.33 | 0.19 |
| 4. Express (4a-3b)(4a+3b) as a polynomial. | 26.67 | 0.07 |
| Overall Percentage | 46.85 | |

*Leged: % - Percentage of students who got the correct answer; SD- Standard Deviation*

Result revealed that item nos.17, 5, and 22 are the top 3 questions that students answered correctly while question nos. 4, 10, and 29 are the bottom 3. The students are comfortable with series and sequence, however, less than 5 of 10 of them found the correct answers on the questions pertaining to operations of polynomials. Another point to consider is that less than 4 out of 10 of them were able to recall the basic principle of exponents, as in item no. 20.

Questions 29, 23, and 21 are the cohesive questions for algebra with SD 0.03, 0.04, and 0.05, respectively.

Looking at the overall percentage, above results is also reflective of the TIMMS report in 2007 and 2011 where scores of the student respondents in Algebra domain are relatively low [14].

Table 4. **Performance of the Incoming Freshmen Student of College Of Teacher Education on Areas of Mathematics when grouped according to Geometry**

| Test Items | % | SD |
|---|---|---|
| 15. How many rectangular lots 10m by 40m can be contained in a square lot with an area of 160,000 square meters? | 70.00 | 0.11 |
| 11. Find the dimensions of a cube whose volume is 512 $m^3$. | 60.00 | 0.13 |
| 24. If <1 is $120^0$, what is the measure of <16? | 56.67 | 0.21 |
| 2. The ratio 6:9 is equal to _____. | 48.89 | 0.06 |
| 12. Find the measures of two supplementary angles if one angle is 5 times as large as the other angle. | 46.67 | 0.19 |
| 3. How long is the cyclone wire needed to fence a circular lot whose diameter is 16 meters? | 35.56 | 0.06 |
| 25. If <5=$130^0$, what is the measure <6? | 25.56 | 0.10 |
| Overall Percentage | 49.05 | |

*Leged: % - Percentage of students who got the correct answer; SD- Standard Deviation*

Table 4 shows the performance of the incoming freshmen student of college of teacher education on areas of mathematics when grouped according to Geometry. Question number 3 showed cohesiveness 0.06 SD. Topics pertaining to angles may prove to be a difficult area for the students since it showed scattered results. The other question involving angles also showed the lowest among the questions in the area.

The data above also shows that more than 50% of the takers was not able to get the right answer on topics involving angles, ratio, and circles.

Factors such as teaching methodology, difficulty to visualize and find proof, and poor reasoning skills make learning of geometry, as well as teaching the same, a difficult mathematics domain [15].

Table 5. **Performance of the Incoming Freshmen Student of College of Teacher Education on Areas of Mathematics when grouped according to Trigonometry**

| Test Items | % | SD |
|---|---|---|
| 7. If one acute angle of a right triangle is $22^0$, the other acute angle is _____? | 66.67 | 0.10 |
| Overall Percentage | 66.67 | |

*Leged: % - Percentage of students who got the correct answer; SD- Standard Deviation*

Table 5 shows the performance of the incoming freshmen student of college of teacher education on areas of mathematics when grouped according to trigonometry. Result revealed that the questionnaire have only one item on areas of Trigonometry where about 67% of the students got the correct answer.

The lone item for trigonometry may mean the result is not conclusive, thus, a revision of the questionnaire may be apparent.

It may be beyond 50% of the takers were able to answer the question correctly, however, the question is among the very basic topics of trigonometry. Thus, somewhat higher than 70% is expected.

Trigonometry is a subject that banks on the interrelations among, basic math, algeba and geometry. As such, strong foundations on these mathematics area are requisites to understanding trigonometry. Students who find difficulties in trigonometry are those who have incomplete or patchy knowledge of those subjects [16].

Table 6. **Performance of the Incoming Freshmen Student of College of Teacher Education on Areas of Mathematics when grouped according to Statistics**

| Test Items | % | SD |
|---|---|---|
| 28. The mean of seven scores is 2.1. Find the sum of the scores. | 57.78 | 0.18 |
| 27. The score of a student in three tests are 19, 17, 1nd 15. What must be his 4th score to gain an average of 17? | 43.33 | 0.10 |
| 26. The graph used to show the relationship of a part to the whole is _____. | 41.11 | 0.08 |
| Overall Percentage | 47.41 | |

*Leged: % - Percentage of students who got the correct answer; SD- Standard Deviation*

Table 6 shows the performance of the incoming freshmen student of college of teacher education on areas of mathematics when grouped according to statistics. Item 28 showed that most of the students were able to get the correct answer, however, it also revealed scattered results.

As with other mathematics domain, factors such as cognitive ability, textual comprehension and the ability to translate text to numbers make it difficult for the students to grasp statistics [17].

With the above data, it is apparent that pedagogical enhancement is necessary in order for the students be equipped with strong knowledge and skills in mathematics. Among these development in pedagogies are utilization of or employing technology in the teaching of mathematics. Accordingly, teacher skills may also be enhanced for them to cope with the new teaching requirements in mathematics.

Among the pedagogical enhancements that the College implemented are peer tutoring, math camp, and remedial classes. The peer tutoring is being done by the senior/higher year BSEd–Math majors to their freshmen counterparts on a weekly basis. Peer tutoring is deemed an important teaching strategy to enhance students knowledge as well as making them comfortable as they learn [18]. While the math camp is being done every semester. Both of these activities are spearheaded by the Math Club. On the same note, the remedial classes are initiated by the Math instructors under the College of Teacher Education. Remedial instruction is also considered to be an important strategy to enhance students' learning, interest and competence in mathematics [19].

According to Ling [20], Math camps is an effective intervention to enhance student knowledge, skills and outputs, which also help change students' perspectives towards mathematics.

## CONCLUSION AND RECOMMENDATION

The study found that the admission test results of the incoming freshmen of the College of Teacher Education for mathematics for the past 5 years were reflective of global scenario [7]. It was Trigonometry and Basic Mathematics formed the extreme ends of the math spectrum. Considerably, the admission test did not include a question that involved calculus. Basic education curriculum prior to K to 12 does not include calculus and even in the new curriculum (K to 12), not all students need to study calculus among other specialized mathematics areas [21].

The study also identified salient topics in each area of mathematics where the incoming freshmen showed their weakness and their strength. For example, in basic mathematics, most of the students got correct answers in questions involving "percentage" while few of them got the correct answers in the topic of "least common multiple". For Algebra, most of them got the questions involving "sequences and series" while most of them got it wrong on questions involving "special products of binomial." Also, specific topics were also identified for geometry, and statistics.

With the foregoing, the author deemed it appropriate to recommend some pedagogical enhancement that involves all the areas of mathematics, and taking into consideration the specific topics that the students showed poor performance. These pedagogical enhancement may include the design of learning materials and modes of implementation of these materials [10]. A bridging course may also be offered by the college to help enhance student mathematical knowledge and skills.

This study focused on the results of the admission tests conducted by the College and the pedagogical enhancement undertaken by the College. However, the effect of the pedagogical enhancement undertaken was not covered by this study. The data and findings of this study may be a basis for future study and may be extended beyond the locale of this study.

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