EXPLORATORY ANALYSIS OF STUDENT'S PERFORMANCE IN ALGEBRA AND PLANE TRIGONOMETRY: A PROPOSED ENTRANCE EXAM POLICY

Ed Neil O. Maratas[1]

Abstract

A three-year data, specifically from school year 2008 – 2009 to 2010 – 2011, on students' performance in mathematics subjects (College Algebra and Plane Trigonometry) were analyzed to determine the following: (1) enrolment in these two disciplines; (2) the number of passers in each subject; (3) the number of dropouts, which include unofficial withdrawal and official withdrawal; (4) report of average final rating in College Algebra and Trigonometry, and (5) higher percentage of passers, drop outs or failed in College Algebra and Trigonometry subject. Mean, percentage, graphical and tabular methods were used to present, analyze and interpret the available secondary data. Results of the study revealed an upward trend of enrollment in Trigonometry and gradual downward trend of College Algebra which signifies re-takers enrolled every year. Furthermore, there were few female students who performed better compared to their male counterpart. In addition, males had higher percentage of drop outs in College Algebra and Plane Trigonometry over the period of years covered. Findings of the study also showed that there were some students who were not totally prepared to take the said subjects. Further, new input data for tertiary education indicate females performing good compared to their male counterparts have fair performance in both disciplines. The concerned offices are hereby requested to issue a formal memorandum for compliance and implementation of an Entrance Examination Policy and a separate course (Math 0) for incoming freshmen students who wanted to enroll Computer Science.

Keywords and Phrases: *Students' Performance, Exploratory Analysis, College Algebra, Trigonometry, Entrance Exam Policy*

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Introduction

One of the issues that students most often discussed and complained regarding science and mathematics has to do with the complex relationship between their performance, their interests, and their motivation towards science and mathematics. They had the impression that science and mathematics must solely be the domain of geniuses or the intellectual "elites." One Physics student in the study of Lipson and Tobias (1991) reveals that to some extent science is hard because it is simply hard. The materials to be learned involve a great quantity of concepts, some of which are very counterintuitive. These situations do not only happen in JRMSU but to all colleges and universities. This study highlights specific issue of particular interest to teachers, researchers, administrators and the top management group in providing quality education to students. All colleges and universities aim to produce quality professionals in the global arena. Thus, there is a need to continuously monitor the knowledge, skills, and performance of students in the College Algebra and Trigonometry, which are viewed as basic courses in the general education curricula, vis-à-vis with the problems experienced by the department head relative to: (1) enrollment in the two areas; (2) number of passers in each course covered in the study; (3) the number of dropouts, which include official and unofficial withdrawal; (4) the final report of rating in college algebra and plane trigonometry.

Looking closely at the policies of JRMSU particularly on student's admission, the researchers found out that there was no entrance exam policy for incoming freshmen students in various fields of interest especially in the courses offered by College of Arts and Sciences, the Computer Science in particular. The researchers also found out that Computer Science curriculum integrates and emphasizes major subjects such as College Algebra, Analytic Geometry, Differential Calculus and Integral Calculus. The researchers believe that the higher the final high school grade in math subjects the better is the performance of students in math subjects in the tertiary level. Further, there was no remedial class offered for math subjects like Math 0. If the results signify that incoming freshmen or fourth year high school graduates are not equipped with the mathematical skills required for college work, thus it should be advised that the said students should undergo remediation course prior taking up College Algebra and other mathematics subject particularly those who want to pursue Computer Science. This further supports the researchers' contention of the need to offer Math 0 before any mathematics course for students whose high school grade in mathematics is poor.

This study examines the profiles, recent trends and patterns of the students' performance in College Algebra and Plane Trigonometry subjects in Jose Rizal Memorial State University from 2009 to 2011 respectively. Likewise, it attempts to present explanations as to the interacting factors (high school grade) affecting students' performance. Findings will serve as springboard to guide the top management group in dealing with the college present problems, thus enabling them to find the "essentials" and relevant alternative solutions to mitigate if not totally expunge the problems. Further, data gathered in the present study will serve as primary source for the school to come up with policy reforms in terms of retention, students' official withdrawal, unofficial withdrawal, enrollment and results of their final report of rating in College Algebra and Plane Trigonometry. Ultimately, implemented reforms would pave way to concerned schools or colleges and support offices in delivering the best services.

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Evaluation of students no longer needs to be based only on one-time measurement, but can be augmented by objective evidence of how much growth has occurred over a period of time. Time-sample evidence is an important predictor of the growth expected in the future (Airasian, 1991). Descampe et al., (1992) cited by Senajo, et. al., (2009) illustrates three major purposes of testing in the classroom: (1) to acquire information about the effectiveness of the instruction, (2) to give feedback to the students about their progress, and (3) to assign grades. They added that testing for the purpose of assigning grades should not take place until intermediate grades. Further, standardized tests and commercially published tests do not help teachers to obtain information about the effectiveness of their teaching, nor do they help teachers to verify student mastery of specific skills and content since they are not able to address the peculiarities of specific learners and classroom environment. Thus, teacher-made tests are good assessment measures for classroom instruction.

The periodic international survey report Trends in Math and Science Study (TIMSS) identified the major causes for low academic performance in math and science, which include: (1) Congested curricula have to be streamlined to focus on the essentials so human and material resources can be devoted to key subject areas instead of a whole potpourri of curricular and extra-curricular subjects and activities; and (2) Teacher training and instructional materials like textbooks and computers are needed to teach key subject areas like Language, Math and Science. In retrospect, the abolition of the Science subject at grades one and two in the 2002 Revised Basic Education Curriculum (Makabayan took its place) was a disastrous and destructive, the report commented. Not only did it represent a real reduction of 20% in the overall coverage of science in the public-school system, it also knocked the foundations out from under the whole structure because a bitter experience is now demonstrating graduates from the public grade schools coming into high school with 33% less Science subject exposure. So far, no researcher has examined patterns of the mean score difference using the TIMSS achievement data between the 3rd and 4th grades. Instead, the performance comparisons have been largely confined within total scores or a set of subcategory scores was observed (Houang et al., 1999).

The cited studies are related to the present study since it integrates the use of grades in mathematics and assess the classroom behavior of students. Thus, the researchers are motivated to conduct this study and feel the need to examine the patterns and trends of students' performance in the College Algebra and Trigonometry which is deemed necessary in Jose Rizal Memorial State University (JRMSU).

Objectives of the Study

In particular, the study attempted to analyze the trends and patterns of students' performance in College Algebra and Plane Trigonometry and to determine the performance of students in these courses from school year 2008 - 2009 to 2010 - 2011 respectively. Specifically, the study sought to determine the following:
1. The profile of the students from School Year 2008 – 2009 to 2010 - 2011 in terms of:
1.1 enrolment in College Algebra & Trigonometry;
1.2 passers in College Algebra and Trigonometry per year;

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1.3 dropouts or failed in College Algebra and Trigonometry per year; and
1.4 average final report of rating in College Algebra and Trigonometry.
2. To examine the following pairs of variables having high percentage passing, high percentage officially and unofficially dropouts in terms of:
2.1 College Algebra and Trigonometry; and
2.2 Gender
3. To determine whether the result of the study supports the researchers' contention of having entrance exam and a separate course Math 0 for incoming freshmen students who wanted to become computer science specialists.
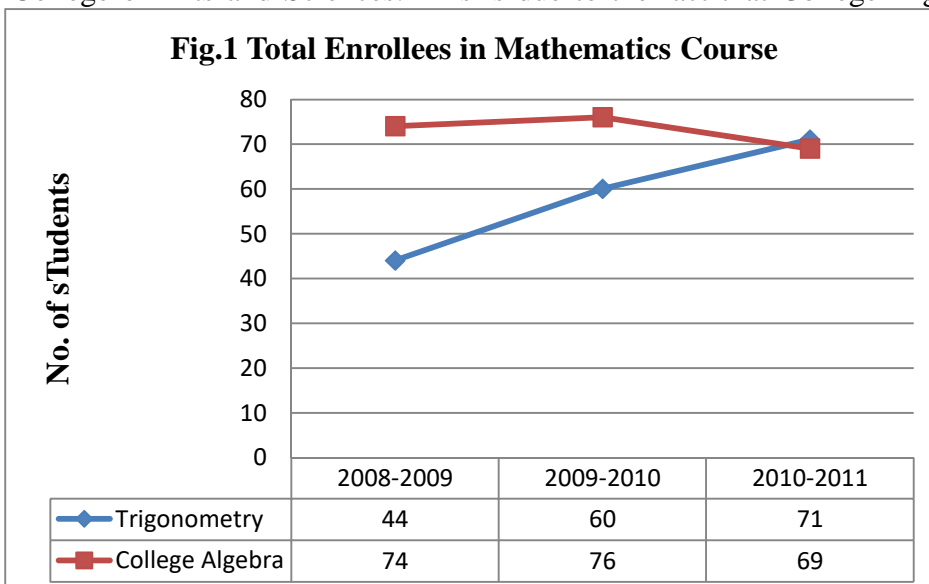
Materials and Methods

The researchers used a descriptive survey method of research to gather and retrieve the needed files or data sets. Specific data sets were taken from the Registrar's Office of Jose Rizal Memorial State University and from the Dean's Office of College of Arts and Sciences. The final rating of students in College Algebra and Trigonometry were taken from the said office as one of main concerns of this study. The gathered data were then segregated and organized, partially eliminating the number of students who were not included as respondents of the study. After which, a purposive sampling was conducted to represent the population of the two-mathematics subject area selected.

After the organization of data, it underwent presentation and tabulation process with the aid of the Microsoft Excel Software. Furthermore, graphical presentation of variables served as guide to look into the pattern and trends of passers, number of drop-outs and other problems mentioned on the objectives of this study. From the results of graph, interpretation, conclusion and recommendation were formulated.

Results and Discussions

Figure 1 presents the relative population size of students in Mathematics courses included in the study. In this study, mathematics discipline is divided into College Algebra and Trigonometry. As shown in figure 1, the upward trend in Trigonometry and gradual downward trend of College Algebra is directly proportional to the number of students' enrollment in computer science of the College of Arts and Sciences. This is due to the fact that College Algebra is one of the major subjects integrated in the curriculum so the enrollment is much higher compared to Plane Trigonometry subject. Moreover, it can be seen that from year 2008 to 2011, an increasing number of enrollment in College

Fig.1 Total Enrollees in Mathematics Course

	2008-2009	2009-2010	2010-2011
Trigonometry	44	60	71
College Algebra	74	76	69

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Algebra occurred in SY 2008-2009 to 2009-2010 and gradually decreasing in SY 2009-2010 to 2010-2011 respectively. More so, this result further explains that there were re-takers and perhaps transferees or shifters students in College Algebra enrolled from year 2008 to 2011 respectively. Enrollees of the two areas were Computer Science students as subject of the study from SY 2009 to SY 2011.

Why do college students leave Computer Science course after one year or even on their first semester of stay? Figure 2 shows a comparison between the number of passers and drop outs or incomplete grades in College Algebra and Plane Trigonometry. The figures revealed a remarkable size of student population dropping from these mathematics courses. Trigonometry and College Algebra ranges of about 11.27% to 31.67% in all years covered usually after the prelim examination or even before midterm examination. Furthermore, student population passers in the subjects range 68.63% to 88.73% respectively. This finding is indicative of an existing problem that has been overlooked by concerned department or college, i.e., the College of Arts & Sciences. This result supports the fact that mathematics is a difficult subject and that is why students paved way on courses with lots of mathematics subjects integrated in their curriculum. Moreover, students were really afraid not to finish the recently taken course after 4 years in school. So, some shifted and looked for another course that really fits the level of knowledge acquired.
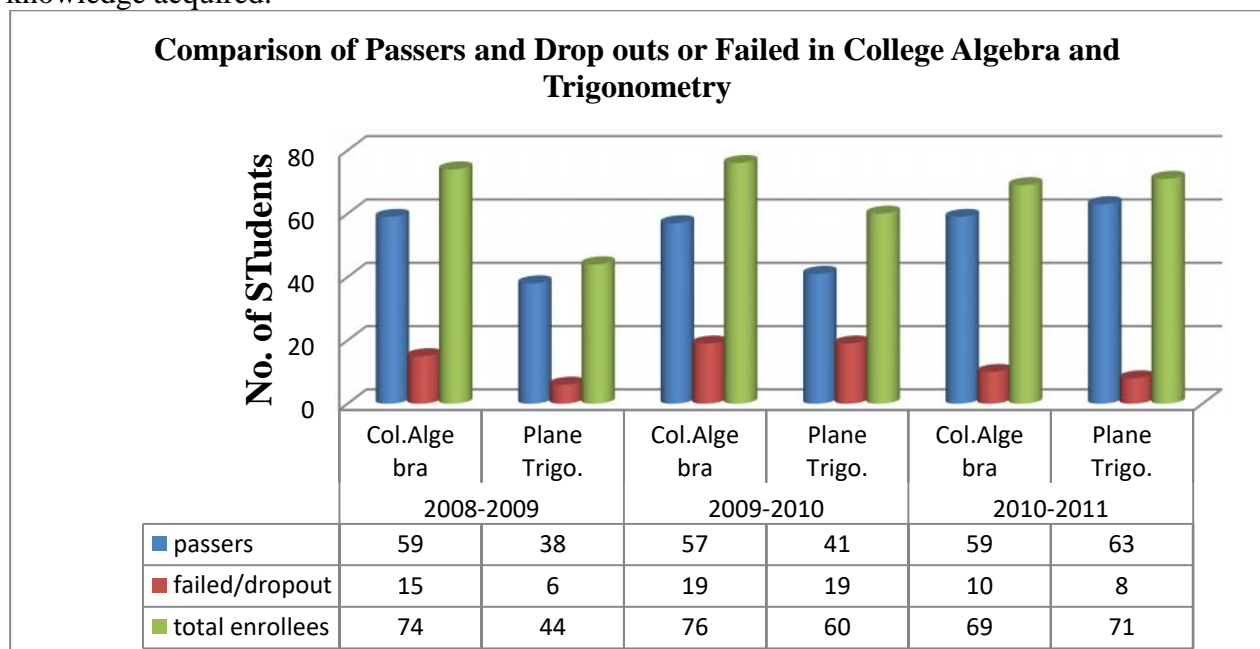

Comparison of Passers and Drop outs or Failed in College Algebra and Trigonometry

| | 2008-2009 | | 2009-2010 | | 2010-2011 | |
	Col.Algebra	Plane Trigo.	Col.Algebra	Plane Trigo.	Col.Algebra	Plane Trigo.
passers	59	38	57	41	59	63
failed/dropout	15	6	19	19	10	8
total enrollees	74	44	76	60	69	71

Figure 2 Comparison of Passers and Drop out/Failed Students in College Algebra and Trigonometry

With some of the reasons gathered by the researchers, through informal interview of students who eventually dropped off found out that these students were not good in mathematics subjects. In other words, students were not really prepared for the next steps and lessons in the said subjects. Furthermore, teacher factor, financial problem and incurred absences beyond the maximum requirement demand utmost validation support. With this finding, the researchers suggest to the administration concerned for a need to engage a seminar –workshop for instructors/professors in the teaching practices and strategies for them to be more students –

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centered rather than subject – oriented without sacrificing the content of the course. Lipson et. al., (1991) cited in their study that good students may be lost at the college level not because they failed in mathematics subjects but because teachers fail them. In addition, students' academic efforts should take into consideration and should be grounded with their love for the subject and need an intrinsic motivation for their work.
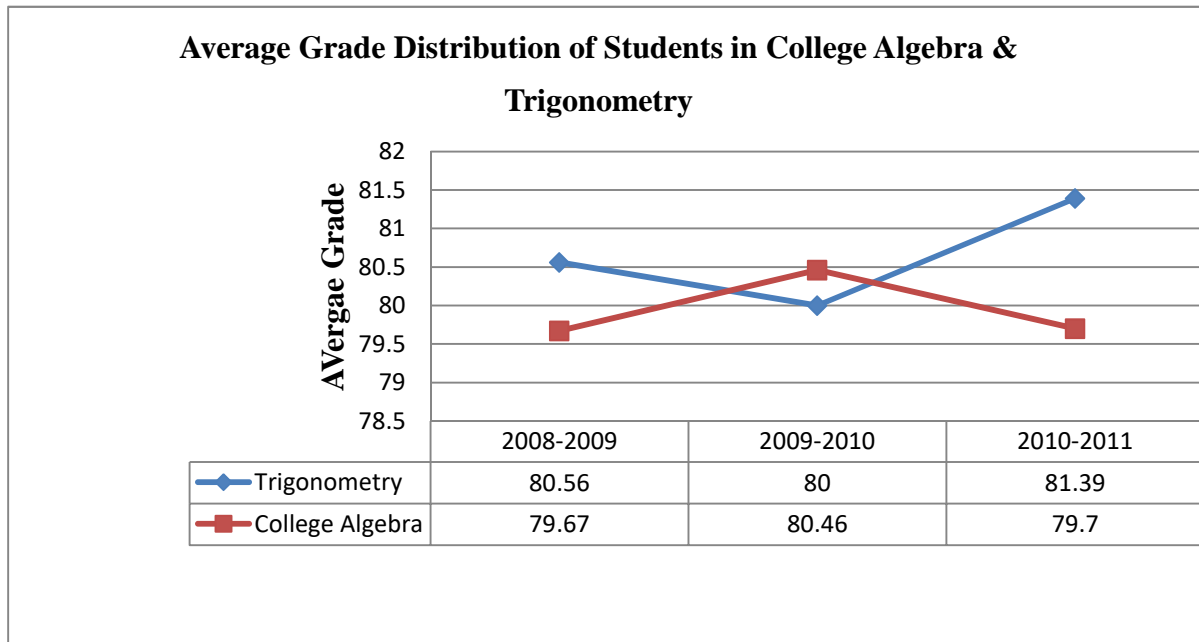
Average Grade Distribution of Students in College Algebra & Trigonometry

	2008-2009	2009-2010	2010-2011
Trigonometry	80.56	80	81.39
College Algebra	79.67	80.46	79.7

Figure 3 Average Grade Distributions of Students

Figure 3 reflects the average grade distribution of students in College Algebra and Trigonometry subjects. A comparison in two Mathematics courses serviced by the College of Arts and Sciences as shown in *Figure 3* indicates that College Algebra is probably the least liked course with students' performance ranging 79.67 percent to 80.46 percent equivalent from fair to good. This implies that there were only few students who had good performance compared to their counterpart. Though there are many students who failed or even dropped off the subject after the first semester, but the enrollment held slightly the same in the next year enrollment. Yet, it was predictable since College Algebra is a math subject taken by all first-year students and, in addition, by that re - takers. It further deduced that students have poor background in mathematics during their high school days.

Gender differences in Mathematics learning continue to attract many researcher's attention as cited by Xin (1995). Burton, et. al., (1986) which demonstrated that gender differences in the course under investigation are not evident during the early school years, but girls begin to fall behind during the intermediate school years, and further behind during high school years. Since most of the studies were concerned and were centered in elementary and secondary levels. The

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present study, however, dwells on data gathering information on gender differences at the tertiary level.

Table 1 shows the comparison between males and females percentage passers and number of each group who have failed or dropped out in College Algebra and Trigonometry. It can be drawn from the table that female group outperformed their male counterpart as far as College Algebra and Trigonometry subjects are concerned across the years covered. Overall performance classifies females as good (84.4%) while the male group as fair performance (76.1%).

Table 1 Comparison of Students' Performance between Males and Females in Mathematics

Performance Rating	Plane Trigonometry				College Algebra			
	Male	%	Female	%	Male	%	Female	%
Passed	65	75.6	77	86.5	82	77.4	93	82.3
Failed/Dropouts	21	24.4	12	13.5	24	22.6	20	17.7
Total	86	100	89	100	106	100	113	100

While the present study limits itself only in determining the number of males and females passing the two subject areas, the researchers recommend that this finding be subjected to test of significance. However, the same trend can be drawn from Table 1 of the other variable taken in considerations. Males have higher percentage of failing grades or drop outs in both disciplines than females. This was indicated during the sampling period covered with majority of males who have dropped out or failed the subjects. This was evidently shown that presently females are dominant in the College of Arts and Sciences in terms of the number of enrollment particularly in Computer Science department.

Senajon, et. al., (2009) corroborated the present findings. They asserted that female group outperformed their male counterpart in both disciplines across the years covered. Overall performance classifies females as good (74%) while the male group as poor performance (66%). In addition, it emphasized further that the same trend can be drawn from the other variables taken in consideration. Males have higher percentage of failing grades, incomplete grades, unofficial dropouts and official dropouts both subjects.

From the foregoing results, this study supports the researchers' contention of having entrance exam and a separate course Math 0 for incoming freshmen students who wanted to become computer science specialists. In one way or another, this can help department's income generating project and for the instructors to be totally aware the students' level of knowledge and understanding in handling the subject. Besides, it could help JRMSU to maintain its standards and to strengthen the quality of its graduates.

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