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RESEARCH ARTICLE

Comparative assessment of academic performance in Mathematics of college freshman civil engineering students: Inputs to numeracy enhancement extension project

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Abstract

Objective:To determine the profile of the freshman civil engineering students in Eastern Visayas State University, Philippines; to determine the mathematics performance of the students in the diagnostic test; to determine the performance of the students in the paper-and pencil test; to identify the difference in performance of the students in the paper-and pencil test when grouped according to profile variables; to determine the difference in the performance of the students in Diagnostic Test when grouped according to profile variables; and to propose a numeracy enhancement extension project based on the result of the study. **Methods**:This study used a comparative research design and involved 131 civil engineering students. **Findings**: Based on the results of the study, the following conclusion were drawn: Majority of the freshman students in civil engineering program are graduates from public Senior High Schools in Tacloban City under the STEM track, a number of them failed in algebraic expressions, equations, straight lines, conics, and trigonometry during the diagnostic test while they performed better in math enhancement and differential calculus when grouped according to the senior high school they graduated from, type of school, and track. The performance of students in diagnostic test when grouped according to senior high school from which they graduated was found significant, while performance of students in diagnostic test when grouped according to the school type were found not significant. Finally, the performance of the students in math enhancement in the paper and pencil tests when grouped according to profile variables was found significant when grouped according to senior high school they graduated from but not significant when grouped according to school type and track.

Keywords: Mathematics performance; numeracy enhancement; comparative assessment

1 Introduction

The K to 12 Program covers Kindergarten and 12 years of basic education (six years of primary education, four years of Junior High School, and two years of Senior High School [SHS]) to provide sufficient time for mastery of concepts and skills, develop lifelong learners, and prepare graduates for tertiary education, middle-level skills development, employment, and entrepreneurship. The academic track that prepares them for college injects vital knowledge, skills, and subjects to tailor their course. Hence, senior high school graduates develop an academically prepared mind and a routine that makes them college-ready. Science, Technology, Engineering, and Mathematics are intertwining disciplines when applied in the real world. The difference of the STEM curriculum with the other strands and tracks is the focus on advanced concepts and topics. Under the track, one can become a pilot, an architect, an astrophysicist, a biologist, a chemist, an engineer, a dentist, a nutritionist, a nurse, a doctor, and a lot more.[(1)]

However, Republic Act No. 7722, otherwise known as the "Higher Education Act of 1994" provides that: All Grade 12 graduates beginning Academic Year 2017-2018 are eligible to enter college regardless of the track or strand taken in the Senior High School.[(2)]

This memorandum gave all graduates the chance to enrol in any college programs which are not align to the academic strand they took in the senior high school. It was observed by the proponent in her classes in Differential Calculus that even the STEM graduates are having problems in applying the basic principles in algebra, trigonometry, geometry and even the basic differentiation which are actually included in the Grade 11 curriculum.

Civil Engineering is a profession that applies the basic principles of science in conjunction with mathematical and computational tools to solve problems associated with developing and sustaining civilized life in our planet. Differential Calculus is the mathematics course offered in the first semester of its curriculum. The principles of mathematics are applicable to the day-to-day duties and routines of a civil engineering career. In order to succeed as a civil engineer, engineering students need to have a thorough understanding of algebra, trigonometry, geometry and, calculus.

Many students lack adequate prior knowledge to extract meaning from instruction. Yet we often make assumptions that they come to class possessing the skills and information to learn what we teach. Some research suggests that this assumption is erroneous and that learning is influenced as much by students' prior knowledge as by the new instruction they receive. Attention, then, needs to be paid to this fundamental aspect of the learning process.

While good instruction is key to achieving academic success, several researchers have identified factors which are considered contributory to learners' academic success. Teachers' background and students' academic achievement are found to be positively correlated, which then implies that teachers who have good qualifications in mathematics have their students performing better in mathematics.[(3)] Also families where the parents are advantaged socially, educationally and economically foster a high level of achievement in their children.[(4)]

The availability, provision and the use of teaching and learning materials go a long way to improve quality teaching which enhances academic performance. Students' attitude towards mathematics influences the efforts they put in understanding and practicing mathematical concepts and skills. According to the National Research Council students' beliefs about their competence and their expectations for success in school have been directly linked to their levels of engagement, as well as to emotional states that promote or interfere with their ability to be academically successful.[(5)]

Additionally, in a study on factors that affect girls' math achievements, parental support, self-confidence, students' interest to math, and cultural issues were pointed out as influencing factors.[(6)]

Also, in an investigation on students' performance in Departmental Examination, it was found that study techniques were the common factor that affects the performance of the students in Mathematics. The researchers formulated an action plan to enhance the students' performance and for the intervention program.[(7)]

Relative to enhancing math interest and achievement,an experiment on the effectiveness of a game-based learning environment was conducted. As a result of this experiment, it was found that there is an increase in students' mathematics achievement, especially in the calculation and word problems. Moreover, the achievements of low-achieving students in the experimental school outperformed the low-achieving students in the control school (a control group in another school) in word problems. Moreover, both the low achieving students and the high-achieving students in the experimental school maintained a rather high level of interest in mathematics and in the system.[(8)]

The relationship between learning styles and mathematics performance was also investigated among middle school students in the USA and in the three top-performing East Asian countries (regions) (Hong Kong, Japan, and Korea), applying a two-level hierarchical linear model (HLM) with students nested within schools to a set of PISA data. It was found that although American students are stronger competitive and cooperative learners than their East Asian peers, they are not effective users of either learning style for the improvement of mathematics performance likely because of the way that both learning styles are practiced in American mathematics classrooms.[(9)]

Meanwhile, in a review on issues related to the assessment process and to the development of assessments that can validly assess mathematical competence in all its complexity; (2) issues related to educational policy and policy-making based on assessment data, in particular the reciprocal relationship between assessment and policy; and (3) issues related to equity, such as gender issues or the achievement gap between majority and minority students. Strong relationships between the three focus areas are found, that impact assessment validity and call for further development of assessment practices in mathematics education. [10]

While several studies have been undertaken to understand factors affecting students' performance in Mathematics, this study only aimed at determining the performance of the students in the diagnostic test which includes the prerequisite knowledge before taking the first mathematics course in engineering program. It also aimed to determine if there is a difference in the performance of the STEM and Non-STEM students in the different paper-and pencil tests given in the course Differential Calculus.

2 Objectives of the study

The findings of the proposed study will be used to design an extension program to help the students prepare their mathematical skills needed in taking any engineering program in college.

Specifically, the study aimed:

1. To determine the profile of the freshman civil engineering students in terms of:
   (a) Senior High School they graduated from,
   (b) School Type, and
   (c) Track taken.
2. To determine the performance of the students in the diagnostic test in terms of the following topics:
   (a) Algebraic Expressions
   (b) Equations
   (c) Straight Lines
   (d) Conics
   (e) Trigonometric Functions
3. To determine the performance of the students in the paper-and pencil test in terms of:
   (a) Mathematics Enhancement
   (b) Differential Calculus
4. To identify the difference in performance of the students in the paper-and pencil test when grouped according to profile variables:
   (a) Mathematics Enhancement, and
   (b) Differential Calculus;
5. To determine the difference in the performance of the students in Diagnostic Test when grouped according to profile variables; and
6. To propose a numeracy enhancement extension project based on the result of the study.

3 Methodology

Research design

The current study used a quantitative comparative research method. Firstly, the data on profile of the college freshman students in terms of senior high school they graduated from, school type, and track taken and their performance in the diagnostic test in terms of the following topics: algebraic expressions, equations, straight lines, conics, and trigonometric functions were described. Also, this study described the performance of STEM and non-STEM students in the paper and pencil tests in mathematics enhancement and differential calculus. Finally, the difference on the performance of the college freshman students in the two areas: mathematics enhancement and differential calculus were tested. As defined, quantitative research is a means for testing objective theories by examining the relationship among variables. [11]

Locale of the study

The study was conducted in Eastern Visayas State University Tacloban, Philippines where the college freshman students are currently enrolled and based on the existing data they come from different types of senior high schools in the Eastern Visayas Region.

Respondents of the study

A total of 131 college freshman civil engineering students from the College of Engineering of the Eastern Visayas State University were involved in the study. They were enrolled during the School Year 2019-2020.

Sampling procedure

This study used the purposive sampling technique specifically the total enumeration where all the college freshman civil engineering students in the College of Engineering were considered samples of the study.

Research instruments

The research instrument was a diagnostic test structured by the researcher in order to fit to the syllabus design for the mathematics course under study. Since the instrument was indigenously made by the researcher, validation was necessary**.**

For the validation of the instrument, the trial run of the instrument was administered by the researcher to students who are not included in the study in order to determine its comprehensibility, usability, and administrability and to identify items not understood by the target participants.

The feedback from the pilot test of the instrument was used for its improvement. When the process and content have already satisfied the rigor or scientific research protocol, copies of the instrument were reproduced and administered to the target participants of the study.

Analysis of data

To determine the profile characteristics of the freshman civil engineering students in the College of Engineering in EVSU, mean, frequency, standard deviation and percentage were employed.

To establish if there is difference on the performance of the college freshman students in mathematics enhancement and differential calculus when they are grouped according to profile variables, t-test for independent samples and ANOVA were used.

The level of significance was set at 5%.

4 Results of the study

The presentation of the results follows the arrangement of the objectives of the study, to wit: profile of the freshman civil engineering students; performance of the students in the diagnostics test in Mathematics particularly in algebraic expressions, equations, straight lines, conics, trigonometric functions; difference in the performance of the students in the paper-and-pencil test according to the profile variables; and finally, difference in the performance of the students in the diagnostic test according to profile variables.

1. On the profile of the civil engineering students

Table 1 shows the profiles of the civil engineering students according to Senior High School graduated from, school type classified as Public and Private, and Senior High school track categorized as STEM and Non-STEM. These are the profile variables deemed relevant to design an extension program.

It can be noted in Table 1 that in terms of Senior High School where respondents graduated from, Tacloban City has the highest frequency of 67 with the 51.1 percentage while outside Region 8 got the lowest frequency of 2 with the percentage of 1.5. This result implies that most of the students graduated from senior high in Tacloban City since it has the biggest number of schools offering senior high including its nearby municipalities.

Under the school type, public school got the highest frequency of 68 and a percentage of 51.9 while private school with 63 frequency and a percentage of 48.1. This result implies that there are more public senior high schools students who were enrolled in Civil Engineering.

In terms of track, STEM is more dominant compared with the Non-STEM. STEM track has the frequency of 88 with a percentage of 67.2 while, non-STEM has the frequency of 43 with a percentage of 32.8. This indicates that more students are now taking up tracks in senior high school that are preparatory to Science and Technology courses. According to the report of the Department of Education (DepEd), the number of students who became interested in Science and Technology (S&T) has significantly increased to 60 percent all throughout the years.[12]

Table 1. Profile of the freshman civil engineering students

Profile Variable	Group	Frequency (n = 131)	Percent (100.0)
Senior High School	Tacloban City	67	51.1
	Leyte	37	28.2
	Biliran	6	4.6
	Samar	19	14.5
	Outside R8	2	1.5
School Type	Public	68	51.9
	Private	63	48.1
Track	STEM	88	67.2
	Non-STEM	43	32.8

2. Performance of the Students in the Diagnostic Test

Table 2 shows the performance of the student in the diagnostic test. Based on the data presented, most of the civil engineering students got a mean that is below 75 in all topics such as algebraic expressions, equations, straight lines, conics, and trigonometric functions. Out of 131 civil engineering students, 46 students have been recorded to be within the conditional failure which has a grade range from 70 to 74 in algebraic expressions. Over-all performance of the students in the diagnostic test has a mean of 73.48 with a standard deviation of 6.534 which could be interpreted as conditional failure. In the four other topics, on topics about Equations, learners obtained a mean of 69.15 and a standard deviation of 9.648; on topics about Straight lines with a mean of 68.82 and a standard deviation of 9.644; on Conics with a mean of 68.98 and a standard deviation of 8.727; and Trigonometric functions with a mean of 67.64 and a standard deviation of 7.489. Over all, these results in the four topic areas in Mathematics seem to be low because the aggregate means in all topics failed to reach the passing grade which is at least 75 percent. The standard deviation results indicate that the students' grades are highly variable in the topics equations and straight lines.

Table 2. Performance of the students in the diagnostic test

Topics	Grade	Qualitative Description	Frequency (n = 131)	% (100.0)	Mean	SD
Algebraic Functions	91 – 95	Excellent	1	0.8	73.48	6.534
	86 – 90	Superior	5	3.8		
	81 – 85	Very Good	14	10.7		
	76 – 80	Good	30	22.9		
	75	Passed	0	0.0		
	70 – 74	Conditional Failure	46	35.1		
	65 - 69	Failure	35	26.7		
Equations	91 – 95	Excellent	4	3.1	69.15	9.648
	86 – 90	Superior	5	3.8		
	81 – 85	Very Good	0	0.0		
	76 – 80	Good	24	18.3		
	75	Passed	0	0.0		
	70 – 74	Conditional Failure	41	31.3		
	65 - 69	Failure	57	43.5		
Straight Lines	91 – 95	Excellent	1	0.8	68.82	9.644
	86 – 90	Superior	0	0.0		
	81 – 85	Very Good	19	14.5		
	76 – 80	Good	0	0.0		
	75	Passed	32	24.4		
	70 – 74	Conditional Failure	0	0.0		
	65 - 69	Failure	79	60.3		
Conics	91 – 95	Excellent	0	0.0	68.98	8.727
	86 – 90	Superior	7	5.3		
	81 – 85	Very Good	0	0.0		
	76 – 80	Good	26	19.8		
	75	Passed	0	0.0		
	70 – 74	Conditional Failure	43	32.8		
	65 - 69	Failure	55	42.0		

Continued on next page

Table 2 continued

Trigonometric Functions	91 – 95	Excellent	0	0.0	67.64	7.489
	86 – 90	Superior	2	1.5		
	81 – 85	Very Good	0	0.0		
	76 – 80	Good	20	15.3		
	75	Passed	0	0.0		
	70 – 74	Conditional Failure	45	34.4		
	65 - 69	Failure	64	48.9		

3. On the performance of students in the paper-and pencil tests according profile variables

The third problem of this study dealt with the performance of the students in the paper-and pencil tests when grouped according to profile variables.

3.1 According to the senior high school they graduated from

Table 3 shows the performance of students in the paper and pencil test according to the senior high school they graduated from. Based on the results in PPTs specifically in math enhancement, students who come from outside the Region 8 got a mean 89.00 with a standard deviation of 7.071; students from Biliran with 88.00 mean and standard deviation of 5.177; students from Samar with a mean of 86.84 and a standard deviation of 6.274; students from Leyte with a mean of 83.38 with a standard deviation of 4.518; and finally, students from Tacloban City with a mean of 82.94 with a standard deviation of 6.252. From the data shown, senior high school students who graduated from Tacloban City were recorded to be at the bottom among the six (6) senior high schools. Meanwhile, the pencil and paper tests in differential calculus got a little the same trend of results but obviously a way lower in the computed mean grades in all senior high school where they graduated from. Again, the students from outside the Region 8 got a mean of 87.00 with a standard deviation of 4.243; followed by those students from Biliran with a mean of 83.83 with a standard deviation of 3.189, next students from Samar with a mean of 78.95 with a standard deviation of 5.390; and finally, students from Tacloban City and Leyte have almost the same computed mean grades. Students from Tacloban City and Leyte were found to be at the bottom based on the PPTs results in differential calculus.

Table 3. Performance of students in the paper-and pencil tests by type of school

	Grade	Qualitative Description	SHS Graduated					Frequency (n = 131)	% (100.0)
			Tacloban City	Leyte	Bilira	Samar	Outside Region VIII		
Math Enhancement	91-95	Excellent	8	3	2	7	1	21	16.0
	86-90	Superior	17	8	3	5	0	33	25.2
	81-85	Very Good	19	14	0	3	1	37	28.2
	76-80	Good	16	12	1	3	0	32	24.4
	75	Passed	3	0	0	0	0	3	2.3
	70-74	Conditional Failure	2	0	0	1	0	3	2.3
	65-69	Failure	2	0	0	0	0	2	1.5
		Mean	**82.94**	**83.38**	**88.00**	**86.84**	**89.00**		
		SD	6.242	4.518	5.177	6.274	7.071		
Differential Calculus	91-95	Excellent	0	0	0	0	0	0	0.0
	86-90	Superior	3	0	1	1	1	6	4.6
	81-85	Very Good	15	3	4	8	1	31	23.7
	76-80	Good	18	14	1	5	0	38	29.0
	75	Passed	5	4	0	1	0	10	7.6
	70-74	Conditional Failure	16	11	0	3	0	30	22.9
	65-69	Failure	10	5	0	1	0	16	12.2
		Mean	**75.93**	**75.05**	**83.83**	**78.95**	**87.00**		
		SD	5.558	4.262	3.189	5.390	4.243		

3.2 According to the type of school

The performance of the students in the paper-and pencil tests by school type suggests that mean grade of the students in the public schools are higher than the students in the private school both for mathematics enhancement (Public: 84.63 > Private:

83.22) and Differential Calculus (Public: 77.72 > 75.49). The results implied that performance of students in either public or private schools have a very slight difference as revealed in the computed mean grades.

Table 4. Performance of students in the paper-and pencil tests by school type

PP Test	Grade	Qualitative Description	SCHOOL TYPE		Frequency (n = 131)	% (100.0)
			Public	Private		
Math Enhancement	91 – 95	Excellent	14	7	21	16.0
	86 – 90	Superior	18	15	33	25.2
	81 – 85	Very Good	16	21	37	28.2
	76 – 80	Good	16	16	32	24.4
	75	Passed	1	2	3	2.3
	70 – 74	Conditional Failure	2	1	3	2.3
	65 - 69	Failure	1	1	2	1.5
		Mean	**84.63**	**83.22**		
		SD	6.227	5.572		
Differential Calculus	91 – 95	Excellent	0	0	0	0.0
	86 – 90	Superior	4	2	6	4.6
	81 – 85	Very Good	22	9	31	23.7
	76 – 80	Good	16	22	38	29.0
	75	Passed	3	7	10	7.6
	70 – 74	Conditional Failure	18	12	30	22.9
	65 - 69	Failure	5	11	16	12.2
		Mean	**77.72**	**75.49**		
		SD	5.622	5.325		

3.3 Performance of students in paper-and pencil tests by track

The performance of the students in the paper-and pencil tests by track suggests that mean grade of the students in the STEM are higher than the students in the Non-STEM both for mathematics enhancement (STEM: 84.55 > Non-STEM: 82.74) and differential calculus (STEM: 77.33 > Non-STEM: 75.26).

Table 5. Performance of students in paper-and pencil tests by track

PP Test	Grade	Qualitative Description	TRACK		Frequency (n = 131)	% (100.0)
			STEM	Non-STEM		
Math Enhancement	91 – 95	Excellent	19	2	21	16.0
	86 – 90	Superior	23	10	33	25.2
	81 – 85	Very Good	22	15	37	28.2
	76 – 80	Good	17	15	32	24.4
	75	Passed	2	1	3	2.3
	70 – 74	Conditional Failure	3	0	3	2.3
	65 – 69	Failure	2	0	2	1.5
	Mean		**84.55**	**82.74**		
	SD		6.414	4.665		
Differential Calculus	91 – 95	Excellent	0	0	0	0.0
	86 – 90	Superior	4	2	6	4.6
	81 – 85	Very Good	28	3	31	23.7
	76 – 80	Good	25	13	38	29.0
	75	Passed	6	4	10	7.6
	70 – 74	Conditional Failure	14	16	30	22.9
	65 – 69	Failure	11	5	16	12.2
	Mean		**77.33**	**75.26**		
	SD		5.743	4.986		

It can be deduced from the data presented that senior high school students who graduated from STEM have better performance compared with those students who graduated from Non-STEM, in both math enhancement and differential calculus paper and pencil test but with a slight difference only.

4. On the difference in the performance of students in the diagnostics test

Table 6 shows the test of difference in the performance of students in the diagnostic test as group according to their profile variables. It could be gleaned that among the three profile variables, only the grouping variable on senior high school where respondents graduated from yielded significant results. With the given results, the null hypotheses that says, "there is no significant difference in the performance of students in diagnostics test when grouped according to profile variables" is rejected at least in senior high school where the students graduated from. Whereas, there is a failure in rejecting the null hypothesis when the performance of the students in the diagnostic test was compared with the profile variables specifically school type and track for both were found to be not significant with a p-value of 0.151 and 0.301, respectively.

And further analysis of the results were treated using the post-hoc test as shown in Table 7 where meaningful differences exist between groups the case of Leyte and Biliran.

Table 6. Test of difference in the performance of students in diagnostic test according to profile variables

Profile Variable	Group	Test Statistic	p-value	Interpretation
Senior High School	Tacloban City Leyte* Southern Leyte Biliran* Eastern Samar Samar Outside R8	F = 5.624	<0.01	Significant
School Type	Private Public	t = 1.444	0.151	Not Significant
Track	STEM Non-STEM	t = 1.039	0.301	Not Significant

Table 7. Post-Hoc analysis in the performance of students in diagnostic test according to senior high school graduated

PPT	Levene Statistic	p-value	Interpretation	Pairwise Comparison	Mean Difference	p-value	Interpretation
Diagnostic Test	1.710	0.152	Equal Variances Assumed	Leyte*Biliran	7.56757	0.013	Significant

5. Difference in the performance of students according to their profile variables

Table 8 shows the significant difference between profile variables and performance of the students in the paper-and pencil tests in mathematics enhancement and differential calculus.

It terms of senior high school where respondents graduated from, it can be inferred that there is significant difference among the group of schools they graduated from ($F = 2.916$, $p<0.05$) in mathematics enhancement and in differential calculus ($F = 7.227$, $p<0.05$). It implies that school graduated may influence the benefits of getting good grades or perform better in a test.

In terms of school type and track, it can be inferred that there are significant differences in the performance of students in differential calculus when grouped by school type ($t = 2.33$, $p<0.05$) and track ($t = 2.124$, $p<0.05$). These further indicate that there is a difference in the performance of the students in public and private and STEM and Non-STEM.

Table 8. Test of difference in the performance of students according to profile variables

Profile Variable	PP Test	Group	Mean	Standard Deviation	Test Statistics	p-value	Interpretation
Senior High School Graduated	Math Enhancement	Tacloban City	82.9403	6.24228	F = 2.916	0.024	Significant
		Leyte	83.3784	4.51757			
		Biliran	88.0000	5.17687			
		Samar	86.8421	5.27396			
		Outside Region VIII	89.0000	5.94056			
	Differential Calculus	Tacloban City	75.9254	5.55772	F = 7.227	<0.01	Significant
		Leyte	75.0541	4.26188			
		Biliran	83.8333	3.18852			
		Samar	78.9474	5.39005			
		Outside Region VIII	87.0000	4.24264			
School Type	Math Enhancement	Public	84.6324	6.22682	t =1.368	0.174	Not Significant
		Private	83.2222	5.57195			
	Differential Calculus	Public	77.7206	5.62204	t = 2.330	0.021	Significant
		Private	75.4921	5.32454			
TRACK	Math Enhancement	STEM	84.5455	6.41462	t = 1.640	0.103	Not Significant
		Non-STEM	82.7442	4.66544			
	Differential Calculus	STEM	77.3295	5.74300	t = 2.124	0.036	Significant
		Non-STEM	75.2558	4.98614			

The post-hoc test was utilized in this study since significant results were found in the analysis of variance. Post-Hoc test is a priori test for which a specific pairwise group differs where it is performed when the results of an ANOVA yielded a significant F-statistics. It is classified into equal variances assumed and unequal variances assumed.

For the Mathematics Enhancement, the ANOVA shows significant results but the post-hoc test does not, this implies that the data is not sufficient to make statements about pairwise comparisons because some groups have smaller sample sizes which lead to loss of statistical significance for comparing two groups.

For Differential Calculus, The Levene statistic is a test for homogeneity of variances, as can be gleaned from the table, the p-value (0.146 > 0.05) is thus interpreted, as equal variances assumed. Further, the Scheffe post-hoc test is deemed appropriate in exploring all the simple and complex comparisons, equal variances assumed, and unequal group sizes in terms of senior high school where the students graduated (Samuels, 2016). Only significant pairwise comparisons are shown. The table shows that there is a meaningful difference in the means of the groups being compared: Tacloban City and Biliran; Leyte and Biliran; and Outside Region VIII and Leyte.

Table 9. Post-Hoc analysis in the performance of students according to senior high school graduated

PPT	Levene Statistic	p-value	Interpretation	Pairwise Comparison	Mean Difference	p-value	Interpretation
Differential Calculus	1.735	0.146	Equal Variances Assumed	Tacloban City*Biliran	7.90796	0.004	Significant
				Leyte*Biliran	8.77928	0.002	Significant
				Outside Region VIII*Leyte	11.94595	0.039	Significant

5 Conclusion

Based on the results of the study, the following conclusions were drawn: (1) Majority of the freshman students in civil engineering program are graduates from public Senior High Schools in Tacloban City under the STEM track; (2) A number of civil engineering students in EVSU failed in algebraic expressions. Equations, straight lines, conics, and trigonometry as reflected in their performance in the diagnostic test; (3) The civil engineering students performed better in math enhancement and differential calculus as reflected in their mean grade average that range from passed to superior when group according to senior high school graduated from, type of school, and track; (4) The performance of students in diagnostic test when grouped according to senior high school they graduated from was found significant, while performance of students in diagnostic test

when grouped according to the school type and were found not significant; (5) Finally, the performance of the students in math enhancement in the paper and pencil tests when grouped according to profile variables was found significant at least in senior high school they graduated from but not significant when grouped according to school type and track. While, significant results yielded when performance of the students in differential calculus in paper and pencil tests when grouped according to all profile variables.

Recommendations

Based on the conclusions given, the following are hereby recommended:

1. Identify the specific schools in Tacloban City that offer Senior High School Programs who are enrolled under STEM Track and those low performing in Mathematics.
2. Develop modules to enhance numeracy skills of STEM Senior High School Students particularly on topics of algebraic expressions, equations, straight lines, conics, and trigonometric functions.
3. Institutionalize and propose an extension project to enhance the numeracy skills of STEM Senior High Schools students in Tacloban City.
4. In-depth study of profiling of STEM senior high school students on their numeracy skills be conducted that would serve as inputs to a more meaningful extension project of mathematics teachers of the University.

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