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A Comparative Study of the Academic Performance of STEM and Non-STEM Graduates in College and Advanced Algebra

Ruel A. Bautista[1], Michael Howard D. Morada[2], Anne Lorraine J. Pineda[3]
Pangasinan State University

Abstract – *The K-12 curriculum had an additional two years in high school and is intended to enhance the student's specialization in preparation to college. This study compared the academic performance and capabilities of STEM and non-STEM students in the program BSE Mathematics. The researchers used Descriptive Comparative Research Design. It uses two non-manipulative variables: fifteen (15) STEM students and thirty-eight (38) non-STEM students. This study found the capabilities of STEM and non-STEM in terms of; Comprehension in Mathematical Concepts and Process, Problem Solving Ability, and Competencies in College and Advance Algebra. The findings of the study indicated that there is significant difference between the three domains of capabilities of STEM with the overall mean of 3.20 and non-STEM with the mean score of 2.90. The participants of the study demonstrate good enough expectations in the Subject College and Advance Algebra. Moreover, findings revealed that STEM students had higher academic performance compared to non-STEM with an average grade of 1.75 and 2.14, respectively. Therefore, the researchers developed an action plan for non-STEM who obtained the lowest mean in all aspects and recommend to be implemented for it will help in enhancing students' academic performance and capabilities.*

Keywords – *STEM, non-STEM, compare, difference, capabilities*

INTRODUCTION

K-12 educational program is a 13-year basic education cycle from Kindergarten to grade 12. The two years in high school is intended to enhance the student's specialization in preparation to college.

There are three specific tracks that the students can choose from: the Academic Track, Technical – Vocational – Livelihood and Sports and Arts. The academic track consists of four strands namely: General Academic Strand (GAS), Humanities and Social Sciences (HUMSS), Science, Technology, Engineering, Mathematics (STEM), and Accountancy, Business, and Management (ABM). Each of these strands has different specializations that are in line in specific college programs.

The above-mentioned track and strands have their own specializations and strengths. No strand is on top of the other because every strand possesses different competencies; it's on the student's selection which s/he thinks best for the future program that the scholars want to acquire.

K-12 Curriculum has been a subject of debate for the past years. Many studies have been established about the said curriculum and a few of those studies compared the academic performance of Science, Technology, Engineering and Mathematics (STEM) and non-STEM students.

The study of M. Molina (2019) compared the Calculus I performance of engineering students from STEM and non-STEM SHS strands. The findings showed that engineering students performed poorly in Calculus I. Moreover, a significant difference between the performance of non-STEM SHS strands and the engineering students from STEM and in finding derivatives was found. This revealed that the performance of the engineering students from STEM strand in finding derivatives is better than the engineering students from the non-STEM strand.

In the study entitled, "Stem Schools vs. Non-Stem Schools: Comparing Students' Mathematics Growth Rate on High-Stakes Test Performance" by A. Bicer et.al. (2015), the researchers studied how students who attended T-STEM academies performed on the mathematics section of the Texas Assessment of Knowledge and Skills (TAKS) compared to their corresponding peers who attended traditional public schools in Texas. The study included 18 T-STEM academies and 18 matched non-STEM schools. The results revealed that at the end of grade 9, students who attended T-STEM academies performed higher in mathematics compared to their counterparts in comparison schools, but no difference was found in their mean mathematics score's growth rate from 2009 to 2011. Based on the result, students who attend T-STEM academies were already interested in the STEM related discipline, which resulted in their decision to attend T-STEM academies.

The study of Panwar (2018) finds that American STEM students were more engaged in collaborative learning activities as compared to international STEM students, while American and international non-STEM students did not differ much in this outcome. The same is true for freshmen and senior students in collaborative learning; American STEM freshmen and seniors were more engaged in collaborative learning activities as compared to international STEM freshmen and seniors, while American freshmen and senior and international freshmen and senior non-STEM students were not so much different in this outcome. Additionally, international non-STEM seniors were more engaged in effective teaching practice activities as compared to American senior non-STEM students.

Moreover, the study of Rosie Tan and Art Walden Dejoras (2019) also compared the problem-solving ability of Science, Technology, Engineering, and Mathematics (STEM) and non-STEM graduates enrolled in the Bachelor of Science in Mathematics Education (BS MathEd) program. They examined the problem-solving ability of the participant by using the researchers-made Mathematics Problem Solving Ability Test. The findings of their study stated that there was no significant difference between the students graduated from STEM and non-STEM strands in terms of problem-solving ability. The respondents were found to be apprentice in problem-solving, the respondents were not able to give the final correct answers but able to acquire a partly correct solution.

According to the CHED memorandum order no. 75 series of 2017, Mathematics major students must possess the competencies written in this memo.

The competencies needed in Mathematics major can mostly be acquired from the STEM strand. The researchers of this study took the interest to compare the academic performance in College and Advance Algebra of STEM and non-STEM students under Bachelor of Secondary Education (BSE) majoring in Mathematics, because when taking this program, it is advisable that a student is a graduate of STEM strand. However, the researchers have observed that some of the students taking BSE Mathematics are otherwise. Therefore, the researchers conducted this study to know the difference between the academic performance of STEM and non-STEM graduates in a certain mathematics subject.

The researchers of this study have proposed an action plan for the non-STEM students to meet the necessary competencies needed in the program BSE Mathematics. In addition, this research is intended to educate future BSE Mathematics major and help them to be ready and realize what or where they are lacking. This study will also serve as an eye opener to the senior high school students that they should be mindful to what program does their strand fit in.

OBJECTIVES OF THE STUDY

The study determined the difference of the academic performance of the first year students of Pangasinan State University Bayambang Campus who were graduates of STEM and non-STEM strands during the First Semester, A.Y. 2020-2021.

Specifically, the study answered the following questions:

1. What are the perceived capabilities/ expertise of STEM and non-STEM students in terms of:
   a)Comprehension of mathematical process and concept
   b) Problem-solving ability; and
   c)College and Advance Algebra Competencies

2. What is the academic performance of STEM and non-STEM students who took College and Advance Algebra subject?

3. What is the difference between the capabilities of STEM and non-STEM Student?

4. What is the difference between the academic performance in Advance Algebra subject and the strand of the students (STEM vs non-STEM)?

5. What is the proposed action plan for the students to meet the necessary capabilities needed in the subject College and Advance Algebra?

MATERIALS AND METHODS

The researchers engaged descriptive-comparative as a research strategy to attain the objective of this study.

This method was suitable for this study because the researchers are comparing two independent variables which are not manipulated. The two independent variables in this study were the STEM and non-STEM graduates. The researchers desired to compare and find the difference between the academic performance and the capabilities of the STEM and non-STEM students in the program BSE Mathematics.

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Sources of Data

This research dealt about the difference between the academic performance of BSE Mathematics STEM and non-STEM students. All first year students of BSE Mathematics in PSU Bayambang Campus, First Semester of A.Y. 2020-2021 were the participants of this study. There is a total of 53 enrolled freshmen students in PSU Bayambang Campus taking BSE Mathematics. Out of fifty-three (53) students, there were twelve (12) students from GAS strand, fourteen (14) from HUMSS, eight (8) from ABM strand, and four (4) from the TVL track which accumulated a total of thirty-eight (38) graduates from the non- STEM strand during senior high school and the remaining fifteen (15) students were STEM graduates.

Instrumentation and Data Collection

The researchers constructed and conducted an online survey as a data gathering instrument. The questionnaire was composed of two parts; the first part was consisted of the profile of the students and the part two of the questionnaire was composed of three domains: the Comprehension of Mathematical Process and Concept, the Problem Solving Ability, and the Competencies in the subject College and Advance Algebra. These domains were based on the competencies stated on the CHED memorandum order no. 75 series of 2017 and the syllabus of College and Advance Algebra. The researchers have devised a 21-item questionnaire that was inclined in the abovementioned documents to identify the capabilities of the students in College and Advance Algebra.

To ensure the validity and reliability, the professionals who are knowledgeable in the field of this study validated the instrument to. The researchers also conducted a reliability test to ten (10) respondents who are BSE Mathematics freshmen from PSU Alaminos City Campus

Records from the Department Chairman were used for the needed data specifically the grades in College and Advance Algebra of the respondents. The researchers also secured a written permit to the Department Chairman of Science and Mathematics to conduct the study. The instrument was floated by the researchers. After the respondents have taken the survey, data were tallied and tabulated, analyzed, and interpreted

Analysis of Data

In order to analyze and interpret the data gathered in this study, the following statistical techniques and method were utilized:

To identify the perceived capabilities/ expertise of the students, weighted mean was used and interpreted using the following criteria:

Table 1. Criteria for the capabilities of the students

Scale Value	Statistical limits	Verbal interpretation	Verbal Description
4	3.25 – 4.00	Strongly Agree	The students' knowledge exceeds expectations in the subject Collage and Advance Algebra
3	2.50 – 3.24	Agree	The students' knowledge satisfies good enough expectations in the subject Collage and Advance Algebra
2	1.75 – 2.49	Disagree	The students' knowledge does not satisfy expectations in the subject Collage and Advance Algebra
1	1.00 – 1.74	Strongly Disagree	The students' knowledge does not completely satisfy expectations in the subject Collage and Advance Algebra

To evaluate the Academic performance of the students, the grades were accumulated and computed by the subject teacher and the researchers used weighted mean and percentage to distinguish the academic performance of STEM and non – STEM students in the course College and Advance Algebra.

t-test in independent variable was also administered to find the difference between the perceived capabilities/ expertise of STEM and non – STEM students.

To test the difference between the academic performance of STEM and non- STEM student, t-test in independent variable was used.

The data gathered were coded, processed encoded using the Statistical Package for Social Sciences (SPSS), a popular software that can output both descriptive and inferential statistics. The researchers also used Microsoft Excel Data Analysis.

Additionally, the proposed action plan was developed for the strand which needs an improvement based on the findings of this study. The indicators of the three domains in the capabilities/expertise of STEM and non-STEM students which obtained the lowest weighted mean were the focus of the developed proposed action plan.

Furthermore, the writing of the instruction plan that will minimize the errors of the students was based on the errors committed and problems encountered. Emphasis was given on topics which had the greatest number of errors. Furthermore, problems identified to be frequent.

RESULTS AND DISCUSSION

The perceived capabilities/ expertise of the students

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Strands in Senior High Schools have different specialization; thus the students may have a different footing when entering college. In the program BSE Mathematics, there is no specific strand requirement to enrol in this degree. The researchers have observed that the students from this degree came from different strands and have different expertise. Therefore, the researchers uncovered the capabilities of the students in line with the following domains:

1. Comprehension of mathematical process and concept

Table 2. Capabilities/Expertise of STEM and non-STEM Students in terms of Comprehension of Mathematical Process and Concept

Item	Indicators	STEM		NON-STEM		OVERALL	
		WM	DE	WM	DE	WM	DE
1	Students view mathematics as a way of understanding and not as a sequence of algorithms and formulae to be memorized.	3.40	SA	3.21	A	3.26	SA
2	Students can analyze and find patterns in discussions and problems given by the teachers.	3.27	SA	3.03	A	3.09	A
3	Students can easily understand mathematical concepts and formulae.	3.07	A	2.66	A	2.77	A
4	Students can follow the steps or process especially in solving mathematics problem without difficulty.	3.07	A	2.53	A	2.68	A
5	Students can provide examples to any mathematical concepts that was taught by their teacher.	2.93	A	2.66	A	2.74	A
6	Students know the connection of the concepts and its problems and solutions.	3.07	A	2.84	A	2.91	A
7	Mathematics helps students in other aspects like economics, research, health, nature and etc.	3.33	SA	3.37	SA	3.36	SA
	Overall Mean	3.16	A	2.90	A	2.97	A

Legend:
3.25 - 4.00 =exceeds expectations (SA)
2.50 - 3.24 =satisfies good enough expectations (A)
1.75 - 2.49 =does not satisfy expectations (D)
1.00 - 1.74 =does not completely satisfy expectations (SD)

The table 2 showed the capabilities/expertise of the STEM and non-STEM students in terms of Comprehension of Mathematical Process and Concept. The students on both strands attained an overall mean of 2.97 which indicated that the students' knowledge satisfied good enough expectations in the subject College and Advance Algebra.

The STEM students acquired an overall mean of 3.16 which indicated that their knowledge satisfied good enough expectations in the subject College and Advance Algebra. Furthermore, the STEM students strongly agreed that they view mathematics not as formulae to be memorized but as a way of understanding which gained the highest weighted mean of 3.40 wherein the students' knowledge exceeded expectations. On the other hand, non-STEM students showed that their knowledge satisfied good enough expectations in this domain which obtained an overall mean of 2.90 which also indicated that the students' knowledge satisfied good enough expectations. The results insinuated that STEM students have better capabilities/expertise in terms of Comprehension of Mathematical Process and Concept.

2. Problem-solving Ability

Table 3.Capabilities/Expertise of STEM and non-STEM Students in terms of Problem-solving Ability

Item	Indicators	STEM		NON-STEM		OVERALL	
		WM	DE	WM	DE	WM	DE
8	Students can solve more complex problems.	2.93	A	2.50	A	2.62	A
9	Students challenge themselves in solving difficult problems.	3.33	SA	3.13	A	3.19	A
10	Students can construct and solve mathematics problems with different levels of difficulties.	2.87	A	2.47	D	2.58	A
11	Students know and follow the procedures in problem solving and engage them in unfamiliar problems.	3.07	A	2.82	A	2.89	A
12	Students discover new approaches when they are solving a problem.	3.20	A	2.97	A	3.04	A
13	Students are willing and confident to work on any mathematical problems.	3.13	A	2.76	A	2.87	A
14	Students manifest critical thinking and creativity when solving and analyzing problems.	3.33	SA	3.00	A	3.09	A
	Overall Mean	3.12	A	2.81	A	2.90	A

Table 3 showed the capabilities/expertise of STEM and non-STEM students in terms of Problem-Solving Ability which attained the overall mean of 2.90 and indicated that the problem solving ability of the students satisfied good enough expectations of the students' knowledge in the subject College and Advance Algebra.

STEM students' problem solving ability satisfied good enough expectations in the subject College and Advance Algebra which got an overall mean of 3.12. Correspondingly, STEM students strongly agreed that they can solve difficult mathematical problems to challenge themselves, and that when solving mathematical problems, they manifest critical thinking and creativity; both have earned a weighted mean of 3.33. Comparatively, non-STEM students' problem solving ability satisfied good enough expectations in the subject College and Advance Algebra which attained an overall mean of 2.81. Additionally, the non-STEM students' knowledge also satisfied good enough expectations in solving difficult mathematical problems to challenge themselves; this indicator acquired the highest weighted mean of 3.13.

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These results implicated that the STEM students are more capable when it comes to Problem Solving Ability.

3. College and Advance Algebra Competencies

Table 4. Capabilities/Expertise of STEM and non-STEM Students in terms of College and Advance Algebra Learning Competencies

Item	Indicators	STEM		NON-STEM		OVERALL	
		WM	DE	WM	DE	WM	DE
15	Students can simplify linear and rational equations and inequalities.	3.40	SA	3.00	A	3.11	A
16	Students can determine and graph the solution set by applying the different methods of solving linear, quadratic equations and inequalities.	3.30	SA	2.84	A	2.96	A
17	Students can differentiate relations and functions, and graph and perform the operations on function.	3.30	SA	2.87	A	2.98	A
18	Students can solve exponential and logarithmic equations and functions.	3.40	SA	3.08	A	3.17	A
19	Students can apply the remainder and factor theorem in solving polynomial equation and functions.	3.40	SA	3.05	A	3.15	A
20	Students can identify, solve and graph the roots of polynomial equations and functions.	3.13	A	2.97	A	3.02	A
21	Students acquired the basic knowledge about college and advance algebra.	3.33	SA	3.16	A	3.21	A
	Overall Mean	3.31	SA	2.99	A	3.09	A

Presented in table 4 are the competencies of the STEM and non-STEM students in the subject College and Advance Algebra. The participants of the study agreed that they obtained the competencies needed in College and Advance Algebra with the overall mean of 3.09. This implied that the students' knowledge satisfied good enough expectations in the subject.

On top of that, STEM students garnered an overall mean of 3.31 which illustrated that their knowledge exceeded expectations in the course College and Advance Algebra. Moreover, STEM students strongly agreed that they can simplify linear and rational inequalities and equations, they can solve exponential equations, and are able to apply the remainder and factor theorem in solving polynomial equations. These indicators got the highest weighted mean of 3.40 which showed that the STEM students' knowledge exceeded expectations.

In comparison, non-STEM students obtained an overall mean of 2.99 which displayed that the students' knowledge satisfied good enough expectations in the subject College and Advance Algebra.

Additionally, non-STEM students agreed that they have acquired the basic knowledge about College and Advance Algebra which suggested that students' knowledge satisfied good enough expectations and garnered the highest weighted mean of 3.16. Supplementarily, non-STEM students can solve logarithmic and exponential equations and functions which satisfied good enough expectations and got the second highest weighted mean of 3.08.

The results presented that STEM students have acquired more of the College and Advance Algebra Competencies than the non-STEM students.

Table 5. Group Statistics of Capabilities and Strand

STRAND	N	Mean of Comprehension of Mathematical Process and Concept	Mean of Problem solving Ability	Mean of College and Advance Algebra Competencies	Overall Mean
STEM	15	3.16	3.12	3.31	3.20
NON-STEM	38	2.90	2.81	2.99	2.90

The group statistics as table 5 conveyed the mean score of STEM and non-STEM students. Findings showed that both STEM and non-STEM students demonstrated good expectations with the weighted mean of 3.20 and 2.90, respectively. Moreover, the acquired score of the STEM student is higher than the mean score of non-STEM students.

Academic performance of the STEM and non-STEM students in College and Advance Algebra

The table 6 is the academic performance of both STEM and non-STEM students in College and Advance Algebra. The computed mean score for the grades of the STEM students was 1.75, conversely, non-STEM students achieved the mean grade of 2.14.

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Table 6. The Academic Performance of STEM and non-STEM Students in College and Advance Algebra

Grades	STEM		NON-STEM	
	Frequency	Valid Percent	Frequency	Valid Percent
1.00	1	6.7	0	0
1.25	2	13.3	1	2.6
1.50	5	33.3	4	10.5
1.75	2	13.3	4	10.5
2.00	2	13.3	3	7.9
2.25	1	6.7	13	34.2
2.50	1	6.7	4	10.5
2.75	0	0.0	2	5.3
3.00	1	6.7	2	5.3
INC	0	0.0	5	13.2
Total	15	100.0	38	100.0
Mean	1.7500		2.1439	

It can also be seen in table that most of the students in STEM strand had an average grade of 1.75 with the highest percentage of 33.3%. Moreover, the grades 1.00, 2.25, 2.50, and 3.00 were achieved by one respondent, apiece with 6.7% In addition to that, one student from STEM got an excellent grade of 1.00.

In contrast, thirteen (13) out of thirty-eight (38) non-STEM students had a grade of 2.25 with the percentage of 34.2%. Moreover, only one (1) student got a 1.25 grade in the subject College and Advance Algebra, and five (5) students with 13.2% are still incomplete in this subject.

Therefore, findings suggested that the academic performance of STEM graduates was higher than the non-STEM graduates in the subject College and Advance Algebra.

The difference between the capabilities of STEM and non-STEM student.

The researchers conducted an independent t-test to find the difference between the strand and capabilities of the students, the results are presented in table 8.

The first domain which was the Comprehension in Mathematical Process and Concepts acquired $t_{.05} = 2.171$ and p value of 0.035. The computed p- value is less than the level of significance at $\propto = 0.05$. This indicated that the researchers had a strong evidence in favor the alternative hypothesis which stated that there is a significant difference between Comprehension of Mathematical Concepts and Process and the strand of the participants of this study.

		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Upper	Lower
DOMAIN ONE - Comprehension of Mathematical Process and Concepts	Equal variances assumed	2.171	51	.035	.26341	.12132	.01986	.50696
	Equal variances not assumed	2.013	22.264	.056	.26341	.13087	-.00782	.53463
DOMAIN TWO - Problem Solving Ability	Equal variances assumed	2.946	51	.005	.31554	.10710	.10052	.53055
	Equal variances not assumed	2.505	19.406	.021	.31554	.12594	.05232	.57876
DOMAIN THREE - Competencies in College and Advance Algebra	Equal variances assumed	2.174	51	.034	.31805	.14632	.02430	.61179
	Equal variances not assumed	2.340	30.256	.026	.31805	.13590	.04059	.59550
OVERALL CAPABILITIES of STEM and NON-STEM STRAND	Equal variances assumed	2.673	51	.010	.29900	.11187	.07441	.52359
	Equal variances not assumed	2.531	23.125	.019	.29900	.11816	.05465	.54335

The Problem Solving Ability of STEM and non-STEM students obtained the results of $t_{.05} = 2.946$ and p value of 0.005. Likewise, the p-value of the second domain is much less than the level of significance which denoted that the problem solving ability between STEM and non-STEM is statistically significant. Therefore, there was a significant difference when it comes in capability of problem solving between the strand of the students.

The Competencies in College and Advance Algebra was the third domain of the capabilities in this study. The findings of this domain attained $t_{.05} = 2.147$ and a p value of 0.034. This also signified a significant difference between the strand and competencies in College and Advance Algebra.

This implied that there is a sufficient evidence to reject the null hypothesis which stated that there is no significant difference between the capabilities of STEM and non-STEM students. Therefore, the researchers accepted the alternative hypothesis that there is a significant difference between the capabilities and strand of the students.

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The difference between the academic performance of STEM and non-STEM students in the subject College and Advance Algebra.

		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Upper	Lower
ACADEMIC PERFORMANCE of STEM and NON-STEM	Equal variances assumed	-2.784	48	.008	-.40152	.14423	-.69183	-.11120
	Equal variances not assumed	-2.585	22.984	.017	-.40152	.15533	-.72285	-.08018

Findings showed that the difference between the strand and the academic performance is statistically significant with the value of $t_{.05} = -2.784$ at .008 significance lower than the $\propto = 0.05$ level of significance which implied that there is a sufficient evidence to conclude that there is significant difference between the strand and the academic performance of the students. The mean score of the academic performance of STEM with 1.75 is statistically different from non-STEM academic score with 2.14 as presented in the table 6 on page 27. Hence, the null hypothesis which stated that there is no difference between the academic performance of the STEM and non-STEM students was rejected.

Proposed Action Plan for non-STEM students to meet the necessary capabilities needed in the subject College and Advance Algebra

Based on the findings in the previous pages, the researchers found that there were some areas in problem solving where the students gained a low score especially the non-STEM participants. The non-STEM students mostly have lower grades and capability scores compared to STEM students. To cope with the STEM students, the researchers proposed to conduct and participate in bridging programs that will greatly benefit the students to gain knowledge which are not able to obtain during senior high school.

One specific activity for non-STEM students is to take remedial intervention through MS Teams for online conference and/or in their classroom during face-to-face classes together with their mathematics teacher for them to cope up with the STEM students.

Supplementarily, the seniors of BSE Mathematics should organize tutorial programs for the non-STEM students to enhance their problem-solving abilities and be able to solve more complex mathematical problems.

Moreover, to be able to follow the steps and procedure in problem solving mathematics without difficulty and engage them in unfamiliar problems, BSE Mathematics seniors together with their mathematics teachers, should conduct seminars about procedures on how to solve problems easily, and administer a solving fest to encourage the students, especially the non-STEM, to participate and enjoy solving.

Furthermore, volunteer mathematics teachers, and BSE mathematics students from STEM strand should at least once a week before examination (mid-terms and finals) conduct peer mentoring/ tutorials for the non-STEM students to be able to construct and solve mathematics problems with different levels of difficulties.

Upon continuous use of this action plan, non-STEM students are expected to be able to easily understand the lessons, discussions will be more efficient, and all of the learners can follow to the flow of discussion. Likewise, non-STEM students will be able to enhance their mathematical capabilities in solving more complex problems, they will be able to have an improved capabilities in following procedures and solving mathematics, and they are able to familiarize with different problem-solving techniques.

CONCLUSION AND RECOMMENDATION

Based on the findings of the study, the following conclusions were drawn:

1. STEM and non-STEM students have the lowest level of capabilities when it comes to problem-solving. In this ability, the students' knowledge satisfied good enough expectations in subject College and Advance Algebra. Additionally, STEM students consistently obtained higher mean scores than the non-STEM students all throughout the three domains.

2. Majority of the students passed the Course College and Advance Algebra. Also, their academic performances are on the average level. Moreover, STEM students had higher grades compared to the non-STEM in the course College and Advance Algebra.

3. College and Advance Algebra Competencies was the domain which accumulated the highest overall weighted mean, while the Problem solving Ability was the lowest. In line with this, the capabilities of the STEM students have a significant difference from the capabilities of the non-STEM students. STEM students had attained more capabilities than the non-STEM students. Therefore, the capabilities and competencies needed in the program BSE Mathematics are mostly acquired from the STEM strand.

4. The academic performance of the STEM and non-STEM students in College and Advance Algebra had a significant difference. This implied that if a student is a graduate in STEM Strand, then the academic performance of the students is also higher compared to non-STEM.

5. The proposed action plan will help the non-STEM students to cope up with the STEM students and therefore improve the capabilities and academic performance of students especially in the subject College and Advance Algebra, hence the proposed action plan is deemed necessary to be used.

Recommendations

Based on the conclusions of the study, the following recommendations are offered:

1. The incoming Senior High School students, who plan to take BSE Mathematics in the tertiary level, must enrol in the STEM strand for them to acquire the necessary competencies they need before entering college.

2. Universities, specifically their Science and Mathematics Departments, should make a policy about the bridging programs for the non-STEM students who are to take BSE Mathematics to acquire the necessary capabilities attained from the STEM strand.

3. To cope up with the capabilities of the STEM students, the researchers suggest taking tutorials, seminars involving mathematical skills, practice solving, and take extra effort in honing the knowledge already acquired.

4. The subject College and Advance Algebra is a pre-requisite to other subject in mathematics. The researchers advise to non-STEM students to have a remedial intervention to acquire the competencies needed in the subject, thus to advance in the next level and connect the learning's from the previous subject to the new subject.

5. For future researchers to test the effectiveness of the developed proposed action plan.

2. Conduct a longitudinal study for future researchers. A longitudinal study could record the students' capabilities, behaviors in coping and patterns over time. This could provide information and track whether or the strands really affect the capabilities and academic performance of the students.

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PLEASE INCLUDE CONTACT INFORMATION:
NAME: RUEL A. BAUTISTA
CONTACT NO: 09672292242
EMAIL ADDRESS:
RBAUTISTA.BAYAMBANG@PSU.EDU.PH