

Diagnostic Test in College Algebra for Freshman Non-Education Students of Westmead International School: Input to Proposed Remedial Activities

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ABSTRACT

The major thrust of this study is to develop a diagnostic test in college algebra to know the level of performance in College Algebra of non – education freshman students of Westmead International School through the use of a diagnostic test. The researcher used the descriptive method of research.

The level of performance of freshman non – education students of Westmead International School in Algebraic operation has a mean of 80.66 with the highest score of 88 percent and lowest score of 68, while 22 or 31.43 percent had an average performance ranging from 79 - 84. This indicates that students had average mathematical skills and knowledge acquired from their mathematics foundation during high school. The level of performance of freshman non – education students of Westmead International School in arithmetic operation has 77.78 of the mean score with the highest score of 94 and lowest score of 68, which indicates that the students have difficulties in some areas in arithmetic operations. There was a significant relationship between mathematics foundation and the level of performance of the students. The output made by the researcher was a set of Remedial Activities in College Algebra, which is composed of different topics based on the result of the study and on the suggestions of the college instructors of Westmead International School based on their observation. The topics were operation on integers, operation involving polynomials, and special products.

It was recommended that the freshman college students need to take the diagnostic test in College Algebra to determine their level of performance. If they fail in the diagnostic test, they will take Math Plus (Basic Mathematics) instead of College Algebra. The students with good performance in the diagnostic test will take College Algebra.

Keywords – Diagnostic Test, Remedial Teaching, Assessment of Learning.

I. INTRODUCTION

Mathematics as a foundational subject in formal education has been taught from the early academic years of students. Their experiences in learning mathematics can have an impact on their personal and professional formation. Hence, teaching mathematics

crucial to ensure the holistic development of any student and the teacher is faced with the challenge of offering mathematics with ease but with sophistication.

As mathematics instruction is a lengthy, incremental process, it spans all grade and year levels. As children begin formal schooling in kindergarten, they develop ‘number sense’, an

intuitive understanding of foundation number concepts and relationships among numbers. A central part of number sense is the students' ability to internalize the number line as a precursor to performing mental arithmetic. As students' progress through elementary school, they must next master common math operations and develop fluency in basic arithmetic combinations. Successful completion of applied problems requires the students to understand specialized math vocabulary, identify the relevant math operations needed to solve the problem while ignoring any unnecessary information also appearing in that written problem, translate the word problem from text format into a numeric equation containing digits and math symbols, and then successfully solve the mathematics problem.

Grade school pupils take different topics in Mathematics such as fundamental operations, fractions, signed numbers, equations, shapes and figures, and problem solving sequentially, where they must be knowledgeable enough because those are the pre-requisites in taking Elementary Algebra once they enter high school.

Entering into the intermediate level, students must first complete the Mathematics foundation that they need for the next level of study. To proceed to the next level, the students should take and pass the pre-requisite subject. Taking college algebra is not an easy task; students must master it before taking all the higher mathematics subjects, so they will eventually perform well in the subjects.

It is no surprise, then, that there are a number of potential hindrances to student success with applied problems, including limited reading, decoding and comprehension skills, failure to acquire fluency with arithmetic combinations (math facts), and lack of proficiency with math operations. Deciding what specific math interventions are appropriate for any student must therefore be a

highly individualized process, one that is highly dependent on the student's developmental level and current math skills, the requirements of the school district's math curriculum, and the degree to which the student possesses or lacks the necessary auxiliary skills (e.g., math vocabulary, reading comprehension) for success in math.

In teaching mathematics, creativity allows a teacher to produce materials that would capture the interest of the students. Visuals aids, software technology, and even the use of remedial activities have been employed to facilitate mathematics comprehension. Remedial activities in form of workbooks have aided the facilitation and the workbooks have served as a teaching extension.

Ideally, the production of the remedial activities is dependent on the existing performance level of the students. By matching current levels in mathematics against the activities, the facilitation of mathematics comprehension can be greatly achieved. This may be done successfully by employing some diagnostic interventions.

In recent educational development, the reinforcement of teaching through a diagnostic test has served as a tool to measure students' performance, which leads to enhancing or reminding students to have a good performance. This has been very useful for classroom teachers because it may give them satisfaction and confidence to work with the students.

By measuring the skills of the students in terms of mathematical ability for them to take College Algebra easily, the researcher will use a diagnostic test. As a mathematics molder of the young, he has experienced difficulty of instruction on students' learning ability in College Algebra as they failed to acquire skills and abilities in solving problems.

These scenarios led the researcher to conduct a study focused on the performance level in college algebra of freshmen, with the view of using the results as input to proposed

remedial activities. As the researcher is a Mathematics teacher himself, the relationship between the students' performance level and their mathematics foundation as observed in his every day teaching, will be investigated as bases of the production for a remedial workbook.

II. OBJECTIVES

The study aimed to develop a diagnostic test in college algebra for freshman non – education students of Westmead International School as an input to proposed remedial activities. Specifically this study sought answers to the following questions such as the different contents of the diagnostic test in mathematics in relation to algebraic operations and arithmetic operations, the grades of freshman students on the mathematics foundation subjects contribute to their performance in college algebra, the level of performance of the freshman non-education students in the diagnostic test in college algebra with reference to algebraic operations and arithmetic operations, the significant relationships between the grades in the mathematics foundation subjects of the students and the level of performance in the diagnostic test in college algebra and the remedial activities can be proposed to enhance mathematics instruction.

III. MATERIALS AND METHODS

Design

The researcher used the descriptive method of research. This design helped the researcher gather important facts and data regarding the overall logical presentation of the study. Through the use of statistical treatment of data, appropriate conclusions on findings and recommendations were generated which manipulated all the supporting analysis.

Participants of the Study

The participants of the study were the incoming freshman non - education students' of Westmead International School who will take College Algebra one of the minor subjects offered. The respondents of the study could not take any higher Mathematics subject unless they have passed the three (3) unit subject in Mathematics, which is the basic mathematics under the curriculum used by the college or university where they are studying.

The table 1 below shows the percentage distribution of respondents in which each course is represented by five (5) members, except A.B. Political Science with three (3) members and A.B. English with two (2) members only.

TABLE 1
List of Courses of the Student Respondents

Courses	F	%
B.S. Custom Administration	5	7.143
B.S. Criminology	5	7.143
B.S. Accountancy	5	7.143
B.S. Business Administration	5	7.143
B.S. Entrepreneurship	5	7.143
B.S. General Engineering	5	7.143
B.S. Hotel and Restaurant Management	5	7.143
B.S. Tourism Management	5	7.143
B.S. Computer Science	5	7.143
B.S. Information Technology	5	7.143
A.B. Political Science	3	4.285
A.B. Public Administration	5	7.143
A.B. English	2	2.856
A.B. Communication Arts	5	7.143
Hotel and Restaurant Services Management	5	7.143
TOTAL	70	100

Data Gathering Instruments

The study used a diagnostic test in College Algebra, a researcher-made instrument, to measure the learning performance of freshman students in Mathematics foundation subjects during high school. The multiple-choice

instrument was tested for its reliability and validity through the use of SPSS program.

Data Gathering Procedure

The researcher wrote a letter to the president of Westmead International School, which served as the respondent institution, to ask permission to conduct the study. He also asked the help of mathematics instructors to validate the diagnostic test attached to the letter. After the test was validated by the said experts, the test was administered to selected students for pilot testing. Through a series of testing to make the test valid, the researcher administered the test to selected 50 freshman non-education students from different courses chosen through simple random sampling.

The researcher personally administered the test and explained the purpose of the examination and requested the respondents to answer the items independently and in the best manner that they could.

Test planning. The researcher made a diagnostic test as an instrument in measuring the freshman students' learning performance in Mathematics during high school. The researcher used different textbooks as references in making the diagnostic test. The content of the said diagnostic test was purposively studied and identified. The decision of the item format for the purpose of the test was also included in the planning of the diagnostic test used. The test is a multiple choice type, which is flexible in terms of assessing knowledge and higher mental processes.

After reviewing and analysing the objectives, a table of specification was made. This process described and summarized the different contents to be used by the examinees. A table of specification (ToS) is a plan prepared by a classroom teacher as a basis for test construction, especially a periodic test. It is important that this be carefully prepared because it contributes to the development of

the quality of test which per se is a good instrument for diagnostic and remedial teaching. Through it, the degree of content as well as skill mastery can be determined and a balanced test representing varied skills can be achieved. The ToS can also provide an assurance that the test will measure representative samples of the instructional objectives and the contents included in the instruction.

There are two most commonly prepared ToS. These are one – way table of specification and two – way table of specification. In one – way table of specification, only the contents are listed down and on left side; while in the two – way table of specification, the instructional objectives are listed across the top and just like the one – way table, the content areas are listed down on the left side.

In general, the one – way and two – way tables of specification have some commonalities, among them are course content, number of class sessions, number of test items, and placement of an item (Asaad, 2004).

The initial draft of the test was validated through the use of face and content validity, where instructors and grammarians were considered as experts. Westmead International School Mathematics instructors helped to ensure the validity of the diagnostic test. The test validation was done to determine which of the items will be rejected, revised, and or retained.

The data were gathered and collected from the face and content validation as well as the suggestions and recommendations by the experts. These were incorporated and used for the pilot testing purposes.

Reliability Coefficients

N of Students	50
N of Items	80
Alpha	.7094

The original 80 items were reduced to 50 items as a result of the validation procedure. The alpha measures 70.94 percent. Highlighted are the deleted items, i.e. items 3, 5, 9, 11, 12, 14, 19, 24, 27, 28, 51, 59, 61, 62, 63, 64, 66, 67, 68, 69, 70, 71, 73, 74, 75, 76, 77, 78, 79 and 80. The items which remained are items 1, 2, 4, 6, 7, 8, 10, 13, 15, 16, 17, 18, 20, 21, 22, 23, 25, 26, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 52, 53, 54, 55, 56, 57, 58, 60, 65, and 72. These were used in the final diagnostic test in college algebra.

Point – biserial correlation is the correlation between right and wrong scores that students receive on a given item and the total scores that the students receive when summing up their scores across the remaining items. It is a special type of correlation between a dichotomous variable (the multiple – choice item score which is right or wrong, 0 or 1) and a continuous variable (the total score on the test ranging from 0 to the maximum number of multiple – choice items on the test). As in all correlations, point – biserial values range from -1.0 to +1.0. A large positive point – biserial value indicates that students with high scores on the overall test also get the item wrong (which we would also expect). A low point – biserial implies that students who get the item correct tend to do poorly on the overall test (which would indicate an anomaly) and that students who get the item wrong tend to do well on the test (also an anomaly).

The p – value of an item tells us the proportion of students who get the item correctly. When multiplied by 100, the p – value converts to a percentage, which is the percentage of students that got the item correct. The p – value statistic ranges 0 to 1.

A low point – biserial implies that students who got the item incorrect also scored high on the test overall, while students who got the item correct scored low on the test overall. Therefore, items with low point – biserial

values needed further examination. Something in the wording, presentation or content of such items may explain the low point – biserial correlation. However, even if nothing appears visibly faulty with such items, it is recommended threshold value for the point – biserial correlation. A point – biserial value of at least 0.15 is recommended, though experience has shown that “good” items have point – biserial above 0.25.

Reliability Testing of the 50-Item Test for Final Administration

Reliability Coefficients

N of Students	50
N of Items	50
Alpha	.8076

The alpha value = .8076 means that there is a significant reliability among the 50 items used in the final administration of the test. These items are 1, 2, 4, 6, 7, 8, 10, 13, 15, 16, 17, 18, 20, 21, 22, 23, 25, 26, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 52, 53, 54, 55, 56, 57, 58, 60, 65, and 72. (See Appendix A)

The pilot try out was administered to 50 freshman students of Westmead International School. This was used to measure the language suitability and clarity of direction, and to know the average testing time. The test was done in an average of two hours in which students were given 1.3 minutes to answer each item.

The researcher asked the comments and suggestions of the students for the pilot try out. The comments and suggestions were studied upon their ability and skills during the try out and were incorporated for the preparation for the final administration.

The researcher used item analysis (ie. using Point biserial & Cronbach’s Alpha) to know if the items are to be retained, revised, or rejected.

Item analysis refers to the process of examining the students' response to each item in the test. There are two characteristics of an item: desirable and undesirable characteristics. An item that has desirable characteristics can then be retained for subsequent use, and those with undesirable characteristics are either to be revised or rejected. The desirability or undesirability of an item is determined by the three important criteria namely, difficulty of the item, discriminating power of the item, and the measures of attractiveness (Asaad, 2004).

The pilot testing was conducted and evaluated and the final administration was done. It was administered to selected five (5) respondents per course through the use of random sampling. There were 70 respondents from different bachelor's degree courses such as Custom Administration, Communication Arts, A.B. Public Administration, Criminology, Accountancy, Business Administration, Entrepreneurship, General Engineering, Hotel and Restaurant Management, Tourism Management, Computer Science, Information Technology, and Political Science where three (3) students are enrolled, A.B. English where two (2) students are enrolled, and a two - year vocational course Hotel and Restaurant Services Management.

To categorize the level of performance of the students in the diagnostic test in College Algebra in terms of Algebraic operation, Arithmetic operation and High School Foundation (students' grades) separately, the researcher used scale and equivalent descriptions as basis. In the normal curve - 1s to +1s was considered as average performance, greater than +1s high performance and less than -1s was below average.

TABLE 2
Scale on Level of Performance

Score	Level of Performance
91 – 94	Very High performance
86 – 90	Above Average /High performance
80 – 85	Average performance

Statistical Treatment of Data

To describe and interpret the data objectively, the following statistical measures were used frequency, percentage and rank. These were used to determine the number of students in different levels of performance, mean and Standard Deviation which were used to describe the level of students' performance in the diagnostic test, point - biserial correlation coefficient which was used to assess item quality, cronbach's alpha which was used in determining the internal consistency of the test items, and pearson r which was used to compute the correlation coefficient between the level of performance of the freshman students and the high school grades if these were linearly related. It was also used to determine the significant difference between the students' grades in mathematics foundation subjects and the level of performance in the diagnostic examination in College Algebra.

IV. RESULTS AND DISCUSSION

The contents of the diagnostic test in mathematics with the table of specification for both algebraic operations and arithmetic operations are presented and described in this study.

The table of specification showed the 33 total items correspond to their behavioral description from the topics listed such as Algebraic operations and Mathematical expression, Sentence in one and two variables, Special products and factoring, Polynomial function, Quadratic equation and function, and Rational expression.

Knowledge has 10 items such as item number 9, 29, 32 and 37 which belong to Algebraic operations and Mathematical Expression, item number 13 and 16 belong to Sentence in one two variables as topic, Special products and factoring composes of item number 19, items number 12 and 28 belong to

Polynomial Function and item number 31 belongs to Rational expression.

TABLE 3
Table of Specification (ToS) of Algebraic Operations

TOPICS	Knowledge	Comprehension	Application	Total
1. Algebraic operations and Mathematical Expression	9,29,32, 37	38, 30, 39	40,46,47,48	1
2. Sentence in one and two variables	13, 16	44	18,49	5
3. Special products and factoring	19	33,34	35,36	5
4. Polynomial Function	12,28	11,15	27,28	6
5. Quadratic Equation and Function		10	8	2
6. Rational expression	31	41, 42	43	4
TOTAL	10	11	12	33

Comprehension has 11 total items distributed separately from the topics Algebraic operations and Mathematical expression, such as items number 38, 30, and 39, Sentence in one and two variables are items number 44, Special products and factoring include items number 33 and 34, Polynomial function is items number 15 and 15, Quadratic equation and function for item number 10 and Rational expression belongs to items number 41 and 42.

Application has items number 40, 46, 47, and 48, which belongs to the topic Algebraic operations and mathematical expression. Items number 18 and 49 under topic Sentence in one and two variables, items number 35, and 36 are under Special products and factoring, items number 27 and 28 are under polynomial function, item number 8 is under Quadratic equation and function, and item number 43 is under topic Rational expression and have a total of 12 items.

TABLE 4
Table of Specification (ToS) of Arithmetic Operations

TOPICS	Knowledge	Comprehension	Application	Total
1. Sets	1, 20			2
2. Whole numbers	45		26	2
3. Integers	3,4,	5,6, 14	7,17	7
4. Sequence and series			50	1
5. Exponents and radicals		2,21	22,23,24	5
TOTAL	5	5	7	17

Table 4 shows the 17 total items that correspond to their behavioral description from the topics listed such as Sets, Whole numbers, Integers, Sequence and series, and Exponents and radicals. Knowledge has 5 items such as items number 1 and 20 which belong the topic sets, whole numbers are under item number 45, and integers under items number 3 and 4. Comprehension has 5 items

under the topic integers which is composed of items number 5, 6 and 14 and Exponents and radicals has 2 items such as items number 2 and 21. Application has 7 items which belongs to the topic whole numbers, which is item number 26, integers belong to items number 7 and 17, sequence and series belong to item number 50, and topic exponents and radicals belong to items number 22, 23, and 24.

TABLE 5
Summary Table of Content of Diagnostic Test in College Algebra

Content	No. of Item	Percentage
Algebraic Operation	33	66%
Arithmetic Operation	17	34%
Total	50	100%

As shown in Table 5, the contents of the diagnostic test in college algebra were divided into two topics such as algebraic operation and arithmetic operation, having 33 and 17 items respectively. Algebraic operation has only 33 items while arithmetic operation has 17 total items based on the result revealed in determining the test items to be used in the final administration of the study.

There were 33 items on Algebraic operation or 66 percent which are items number 8, 9, 10, 11, 12, 13, 15, 16, 18, 19, 25, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 46, 47, 48 and 49, while there were 17 items on Arithmetic operation or 34 percent, which are items number 1, 2, 3, 4, 5, 6, 7, 14, 17, 20, 21, 22, 23, 24, 26, 45 and 50 of the total 50.

A branch of mathematics that substitutes letters for numbers is algebraic operations. An algebraic equation represents a scale; what is done on one side of the scale with a number is also done to the other side of the scale. The numbers are the constants. Algebra can include real numbers, complex numbers,

matrices, vectors etc. Moving from Arithmetic to Algebra will look something like this: Arithmetic: $3 + 4 = 3 + 4$; in Algebra it would look like: $x + y = y + x$. The actual operations are the same, but in some cases you would favor one method over another even though both methods provide the same answer. Example: $5(3+2+3) = 5(8) = 40$ you would simply add the numbers together and then multiply $x(y+z+t) = (xy) + (xz) + (xt)$ with the x and y and z and t . Since you don't know what the numbers are, an intermediate step might be to do what is shown. You could do the same thing with the numbers and get the same answer but it is not necessary since the numbers are in a form that favors the alternate method. Just to show you: $5(3+2+3) = (5)(3)+(5)(2)+(5)(3) = 15+10+15 = 40$ (www.mathscope.salford.ac.uk/pdfnotes/numarith/p1numarith.pdf)

The study of Agustin – Sicat (2005) supports this study in terms of developing a diagnostic test. In his study, different stages were used such as preparation, development and validation which resulted to very good

content, instructional and technical characteristics of a diagnostic test.

Moreover, Oraa, Simeon, Aldover, Apa – ap and Saplada studied the diagnostic test they made which used an instrument in measuring the level of performance of the students. Specifically, the study made by Aldover supports this study in which the level of the performance of the students in the diagnostic test regarding algebra was categorized. The content of the diagnostic test she made included the algebraic operation, arithmetic operation, geometry and trigonometry.

Grades on Mathematics foundation subjects and performance in college algebra

Students' Mathematics foundation subjects during high school are very important because

they are their pre – requisite subjects to college. Table 6 presents the performance of students on the foundation subjects.

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The table shows the grades of student respondents in Mathematics during high school with a total mean of 82.88 percent and standard deviation of 4.43. The highest grade was 92 percent and the lowest was 75 percent. The performance are categorize into very high ranging from 91 – 94, above average/high ranging from 86 – 90, average ranging from 80 – 85, and below average ranging from 75 – 79.

TABLE 6
Grades on Mathematics Foundation Subjects

Performance of Students	Frequency	Percentage	Rank
Very High (91 – 94))	3	4.28	4
Above Average/ High (86 – 90)	15	21.43	2.5
Average (80 – 85)	37	52.86	1
Below Average (75 – 79)	15	21.43	2.5
Total	70	100	

Highest Grade = 92

Lowest Grade = 75

Mean = 82.88

Sd = 4.43

It can be observed from the table that 37 students or 52.86 of the freshman non education students got higher average performance, while 15 students or 21.43 percent was categorized as both above average/high and below average. Lastly, the 3 students or equivalent to 4.29 percent fall as very high and ranked as fourth.

Moreover, the table also shows that the foundation of the students might have contributed to their performance in college algebra. The mean score of 82.88 is good enough to prove that they are somewhat ready to take College Algebra.

The foundation skills in algebra are a great help to the students when facing the lessons in college. Problems involving algebra in college are more complicated and more exploratory than the problems in high school Mathematics. Therefore foundation in mathematics specifically in algebra must be given emphasis during high school because it will give them more skills so that they will be more competent and confident to solve Mathematics problems in college.

Birkey and Todman (2005) asserted that the key in getting and keeping students actively involved in learning lies in understanding learning preferences which can

positively or negatively influence a student's performance. They mentioned that the most important thing a teacher can do is to be aware of the different learning styles of the learners, so that they may create a more suitable learning plan.

Level of performance of the freshman non-education students

The level of performance of the freshman non – education students are exhibited into two categories: algebraic operations and arithmetic operations.

3.1 Algebraic operations: It can be observed from the table that the mean of 80.66 and standard deviation of 5.30, and having the highest score of 88 percent and lowest score of 68, that 22 or 31.43 percent of the freshman non - education students of Westmead International School had average performance ranging 79 - 84 in the diagnostic test in

College algebra in terms of Algebraic operation. This indicates that students had average mathematical skills and knowledge acquired from their mathematics foundation during high school. Though the performance could have been acceptable, the researcher strongly believes that the mathematical ability of the students must be strengthened or given some reinforcement activities for continuous learning.

This result was supported by the National Secondary Achievement Test results in mathematics and science. From 1996 to 2000, the achievement test showed that the mean percentage score of the students in mathematics which barely topped 50 percent, which meant that only 50 percent of the items were answered correctly in 2000. The students attained an average score of 51.83 percent in mathematics, which is indicated as not a very good performance.

TABLE 7
Level of Performance in Algebraic Operations

Level of Performance	Frequency	Percentage	Rank
Above Average/High (85 - 89)	18	25.72	2
Average (79 - 84)	28	40.00	1
Below Average (75 - 78)	12	17.14	3.5
Poor / Failed (68 – 74)	12	17.14	3.5
Total	70	100	
Mean = 80.06	SD = 5.30	HS = 88	LS = 68

There were 12 or 17.14 percent who belonged to both below average performance, ranging from 75 – 78 and poor/failed ranging from 68 – 74 which ranked as 3.5 in the diagnostic test in terms of Algebraic operation, which indicates that students had weak mathematical skills in the field of Algebraic operation. This may be because of the attitude

of the students in the subject since commonly, students are afraid of mathematics especially with the involvement of variables and its abstractness. It could also be teacher factor. This is in agreement with the National Association of Educational Program (NAEP) of Princeton, New Jersey that 26.9 percent of 13 year old students had not mastered basic

skills taught in elementary. According to this, low marks obtained in mathematics may be attributed to both students and teachers as well.

There were 8 or 11.43 percent of students who got poor or failed ranging from 68 – 74 in the diagnostic test in college algebra, which showed that the students have low engagement in the Algebraic operation due to some factors that affect their performance.

Malasa supported this study on the learning difficulties of students in college algebra. She found out that those students encountered difficulties in working with algebraic expressions and equations. Her study's results suggested that teachers in Mathematics should try varied teaching methods and strategies in teaching algebra.

Generally, the results of the study indicate the need for students to improve their mathematical skill, specifically in Algebraic operation skills. This result showed that the students had poor performance in Algebraic operation and they should be given more advanced work in Algebraic operation as they go along the way.

As the students had average performance, it is inferred that much more may be needed in

the development of their skills regarding algebra.

3.2 Arithmetic operations. Table 10 shows the level of performance of freshman non – education students in arithmetic operations.

The table below shows that with 77.86 as mean score, standard deviation of 5.41, highest score of 94 and lowest score of 68, the level of performance of the freshman non – education in arithmetic operation was categorized according to its scale where 31 or 44.29 percent of the students had average ranging from 79 -84, indicating that the students have difficulties in some areas in arithmetic operation. As what the researcher observed in his teaching experience in college algebra, specifically in arithmetic operation, students who had an average performance show inadequate skills in the field integers specifically on operation, operation on fraction, sequence and operation on radicals. This result was supported by the study of Mendoza (2002), which identified that inadequate skills of students and unmatched learning styles were among causes of students' difficulties.

TABLE 8
Level of Performance in Arithmetic Operations

Level of Performance	Frequency	Percentage	Rank
Very High (90 – 94)	1	1.43	5
Above Average/High (85 - 89)	6	8.57	4
Average (79 - 84)	31	44.29	1
Below Average (75 - 78)	13	18.57	3
Poor / Failed (68 – 74)	19	27.14	2
Total	70	100	
Mean = 77.86	SD = 5.41	HS = 94	LS = 68

Moreover, the level of performance scale obtained by the students in the diagnostic test in arithmetic operation was 19 or 27.14 percent, which belonged to poor or failed and indicated that students did not perform well in the diagnostic test due to their poor study habits. As Minoza stated on his study, the performance of the students in mathematics was affected by their negative attitude in the subject. He found out that the income of parents, type of schools where students are studying, and educational attainments of parents are predictors in mathematics performance among students who have poor performance in mathematics.

Minoza recommended that teachers must exert extra effort such as planning for strategies that will motivate students to study and like the subject better. Parents and teachers' role in guiding and teaching must be developed so that the students can be helped and monitored for better performance. School administrators should initiate livelihood programs among parents to augment their income which will be done through extension program.

Below average students who got 13 or 18.57 of the range 75 - 78 considered their skills to be not too competent. They must be

given emphasis to uplift their level of performance in arithmetic operation. Compared to 6 or 8.57 students who belonged to above average ranging from 85 – 89, which are considered competent, these students should give emphasis when it comes to some skills that they can't master through the use of remedial activities.

Generally, based on the table, only one 1 or 1.43 percent of the total 70 students got very high on the diagnostic test, where the level of performance of the students obtained in the diagnostic test in terms of arithmetic operation can be interpreted as good. Students must be give emphasis on different skills in terms of all fields in arithmetic operation such as sets, whole numbers, integers, sequence and series, and exponents and radicals.

Relationship of the mathematics foundation grades and the level of performance in college algebra

Table 9 shows the significant relationship between the mathematics foundation of the freshman non – education students and their level of performance in the diagnostic test in terms of arithmetic operations and algebraic operations.

TABLE 9

Relationship between Mathematics Foundation and Level of Performance of Students

Variables	r_c	Decision H_0	Interpretation
Algebraic Operation	0.488	Reject	Significant
Arithmetic Operation	0.563	Reject	Significant
Df = 69	$\alpha = .05, 0.1$	$r_t = 0.234$	$r_c = 0.312$

Table 9 shows that the computed values of 0.488 and 0.563 of the variables algebraic operations and arithmetic operations respectively were higher than the tabular value of 0.234 at 0.5 level of significance. These indicate that the null hypothesis was rejected. These also showed that the relationship between mathematics foundation and level of performance in the diagnostic test in terms of

algebraic operation and arithmetic operation is significant.

The study revealed that based on the result of the diagnostic test by the respondents, the test is a good indicator of the students' foundation and increases the level of their performance in college algebra. This attempt was also what other researchers did, as Boo

(2007) studied the learning style and academic performance in the subject. Eventually, the instrument was found to be significant and positively correlated to the academic performance and students' learning. Such results were also confirmed in the studies of Magnaye, Gelera and Cantos (2005) that the students' performance and critical thinking through mathematical problems in algebra revealed a significant relationship between the level of performance and critical thinking.

Remedial activities proposed to enhance mathematics instruction

There are remedial activities to be given to the students who have difficulty in college algebra. As what the researcher experienced in teaching college algebra, most of the students have difficulty in arithmetic operation, specifically in operation of integers, fraction and exponent, while in algebraic operation, students encounter difficulty in finding the roots, radicals, factoring, rational expression and operations on polynomials which lead them to fail the subjects.

Remedial activities can be given by the instructors to enhance the students' performance in algebra, where some of these are through worksheets to be given to the students as form of assignment, in a form of group activities, peer tutoring during their free time, allowing the instructor give them research works, inculcating computer technology in teaching, and through the use of the study by Lilia Abion Ricero regarding tutorial lesson in College Algebra on her thesis "Tutorial Lessons in College Algebra for Students in System Technology Institute (STI – LIPA).

A remedial activity is one that is meant to improve a learning skill or rectify a problem area. Remedial instruction involves using individualized teaching of students who are experiencing difficulties in specific subject areas. Remedial instruction might be taught individually or in groups and targets academic

weaknesses that may hinder learning. Remedial activities teach basic skills that are the foundation for learning a subject in greater detail, and such skills must be learned before students can develop a detailed understanding of the topic of study (<http://www.ehow.com>).

While math comes easily to many students, others struggle with learning the subject in traditional ways. Students who are exceptionally challenged by math benefit from assistance that is tailored to their needs in the classroom. Math remediation activities are a great way for teachers to improve student comprehension and to make the subject more engaging and accessible (<http://www.ehow.com>).

The researcher made a worksheet composed of the proposed remedial activities which, were all designed to help college students strengthen their abilities and skills in solving problems involved in Algebra.

The worksheet also serves as reference for the college algebra instructors in giving remedial activities for the students as they analyze the subject matter critically. This is a set of suggested remedial activities to be given to students who have problems in College Algebra through practicing their fundamental knowledge regarding the subject.

V. CONCLUSION

The diagnostic test determined the level of performance of the freshman non - education students of Westmead International School. The foundation in mathematics of the freshman students has a great impact on the level of their mathematics performance in college. The students' level of performance in algebraic operations and arithmetic operations are both average. There is a significant relationship between the mathematics foundation grades of the students and their level of performance in terms of the diagnostic test in college algebra. The students need to

strengthen their skills and capabilities in college algebra through remedial activities.

VI. RECOMMENDATION

The secondary high school mathematics teachers may conduct some motivational strategies for the students to learn mathematics easily and enthusiastically. The Testing and Placement Office may assess freshman college students through the use of the diagnostic test made by the researcher to evaluate students' foundation in mathematics. College Algebra instructors can utilize some strategies in strengthening the students' ability in College Algebra with the use the remedial activities made by the researcher. Westmead International School can use the diagnostic test as an instrument in determining the freshman students' level of performance in College algebra. If the freshman students fail in the diagnostic test, they will take Basic Mathematics before taking College Algebra, where in Basic Mathematics will be called as Math Plus.

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