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THE EFFECT OF INTRODUCING THE BOX/LATTICE METHOD TO THE COMPETENCY OF GRADE 9 STUDENTS OF HOLY SPIRIT NATIONAL HIGH SCHOOL IN MULTIPLYING POLYNOMIALS

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Abstract:

This action research's objective is to determine " THE EFFECT OF INTRODUCING THE BOX/LATTICE METHOD TO THE COMPETENCY OF GRADE 9 STUDENTS OF HOLY SPIRIT NATIONAL HIGH SCHOOL IN MULTIPLYING POLYNOMIALS." The study was done by Mathematics teachers of Holy Spirit National High School namely Ms. Astrid V. Obongen, Mr. L,eovil M. Allauigan, Meshiell N. Pablo and Mr. Dennis N. Carpo. Experimental Design was used. Two sections with almost equal Mathematical abilities in Grade 9 were chosen, one as the control group which was taught how to use the distributive property and another as the sample group which was taught the Lattice or Box Method. Based on increments of the results of the pre-tests and post-tests, , the sample group fared better on the post tests after they were taught the Box or Lattice Method

Keywords: Lattice Method, equal Mathematical abilities, Box or Lattice Method

1.INTRODUCTION

The lattice method is an alternative to long multiplication for numbers. In this approach, a lattice is first constructed, sized to fit the numbers being multiplied. If we are multiplying an m-digit number by an n-digit number, the size of the lattice is $m \times n$. The multiplicand is placed along the top of the lattice so that each digit is the header for one column of cells (the most significant digit is put at the left).

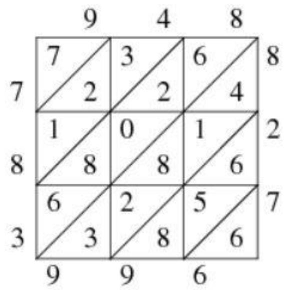


FIGURE 1

The multiplier is placed along the right side of the lattice so that each digit is a (trailing) header for one row of cells (the most significant digit is put at the top). Illustrated below is the lattice configuration for computing (Weisstein,2019).

2.THEORETICAL FRAMEWORK

The method was introduced to Europe in 1202 in Fibonacci's Liber Abaci. In this innovative book, Fibonacci presented many algorithms for working with Arabic numerals. Ancient Indians and Chinese originally invented some of the algorithms.

According to Gu Wenyan, a researcher, "statistically significant differences between the two tests were found on the pre-test (significant at the 0.01 level) and the post-test (significant at 0.05 level) on the basis of the formula of Chi-Square. Students obtained much higher scores in the test with the Lattice Method than with the traditional way of multiplication. Above all, this method improved self-esteem and self-confidence in the students."

Box or Lattice Method in Multiplication of Polynomials is an extension of the process used in multiplying numbers. In this method, the products of terms of polynomials are inside the boxes, not just numbers or coefficients.

Various researches were done by Mathematics teachers like Astrid V. Obongen (one of the researchers of this study) at New Era High School in 2013. In 2017, Ronald E. Mocorro of Leyte Normal University also conducted a research and it was published in Asian Academic Research Journal of Multidisciplinary that same year. Both research showed positive effects of teaching the Lattice method to students.

The figure below shows how to find the product of Polynomials using Box or Lattice Method.

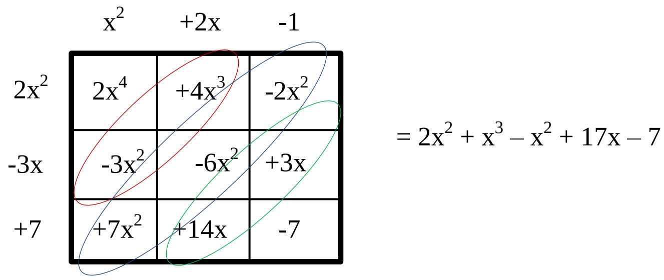


FIGURE 2

1) As illustrated, draw the box or lattice depending on the number of terms of the factors (here it is 3 by 3 since the each factors has 3 terms),
2) Write the terms of the factor across the top and the other down the left side, lining up the terms with the boxes,
3) Multiply the terms at the head of each row and column and fill in each square of the grid with the product of the above and to its left,
4) Add the terms in the grid along the diagonals, starting from the lower left corner,
5) Write the answer by supplying the sum, from the left—down with the variable having the sum of the exponent of the first leading terms of both factors following the next term and so on across the bottom.

The researchers are teachers from Holy Spirit National High School. The public school is located at Kalapati St. Holy Spirit, Quezon City. was founded on 2003,.It caters almost 3000 students.. The researchers would like to find other ways to help enhance the abilities of the students in multiplying polynomials since it was listed as one of the least mastered skills based on the 1st 2 quarters of the school year.in grades 8 and 9. The common methods teachers and students use are the "FOIL" method (First Terms, Outer Product, Inner Product, Last Terms), vertical method and the DISTRIBUTIVE property. The researchers, in their goal to enhance educational instruction, wished to find out whether teaching the grade 9 students the BOX Method will have an effect to their competency in multiplying polynomials.

3.STATEMENT OF THE PROBLEM

The main objective of the study is to determine the effect of introducing the Box or Lattice Method to the Competency of Grade 9 Students of Holy Spirit National High School SY 2019-2020 in Multiplying Polynomials. Specifically, it seeks to answer the following questions:

1. What is the effect of introducing the BOX METHOD to the competency of the Fourth Year High School students of Holy Spirit National High School in multiplying monomials by polynomials?
2. What is the effect of introducing the BOX METHOD to the competency of the Fourth Year High School students of Holy Spirit National High School in multiplying binomials by binomials?
3. What is the effect of introducing the BOX METHOD to the competency of the Fourth Year High School students of Holy Spirit National High School in multiplying polynomials with larger number of terms?

4.HYPOTHESES

H_0:

There is no significant difference in the competency of the students who will be taught multiplication of polynomials using the box method and those who are not.

H_a:

There is A significant difference in the learning competency of the students who will be taught multiplication of polynomials using the box method and those who are not.

5.CONCEPTUAL FRAMEWORK

In this research paper, the input of it is composed of the profile of the grade 9 students-respondents from Holy Spirit National High School. By the process of data gathering through pre-tests and introduction of Lattice Method, the output of this study will be the the post examination results..

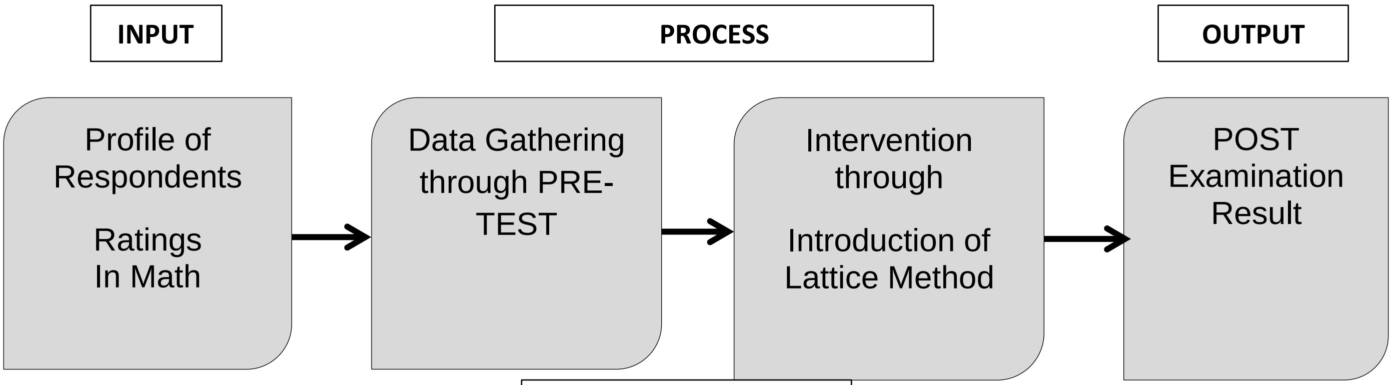


FIGURE 3

6.METHODOLOGY

1. Since the researchers are teaching in Holy Spirit National High School, the study was conducted in the same school. Selective sampling was used. The researchers selected two sections that a researcher currently teaches in Grade 9 (to avoid the teacher factor). The two classes in the assessment of the researchers are almost equal in mathematical performance. The first section, the group which was taught using the BOX METHOD of multiplying polynomials, was the sample group, and the other one, the control group, was taught using distributive and foil method.
2. Both sections were given diagnostic tests on multiplication of polynomials.
3. Both were given review lessons on laws of exponents and addition of polynomials as preparations for multiplication of polynomials.
4. Both groups were taught multiplying polynomials; one by using the distributive or FOIL method, while the other one using box or Lattice method. The post-tests were given after the lessons.
5. Item analysis was done, so as to determine the questions with which the two groups encountered difficulties to answer..
6. The differences of the post-tests and pre-tests were compared and analyzed using descriptive statistics, and in comparing the differences, the researchers decided that the independent t-test, 2-tailed, type 3(unequal variances), is the most appropriate tool to analyze the results.

In a two-tailed T Test, the decision is that, if the statistic t-value is either larger than the upper critical value or less than the lower critical t value, then there is a significant difference between the increments of the scores of the two groups.

7.RESULTS

TABLE 1: SUMMARY OF RESULTS

SUMMARY OF RESULTS						
STUDENTS	CONTROL GROUP			SAMPLE GROUP		
	PRETEST	POST TEST	INCREMENTS	PRETEST	POST TEST	INCREMENTS
1	2	2	0	1	6	5
2	3	2	-1	0	0	0
3	3	4	1	0	5	5
4	3	6	3	1	4	3
5	2	4	2	2	4	2
6	3	1	-2	2	10	8
7	2	1	-1	1	5	4
8	1	1	0	0	3	3
9	3	4	1	2	5	3
10	3	5	2	2	5	3
11	2	0	-2	0	3	3
12	2	4	2	1	4	3
13	3	2	-1	1	0	-1
14	2	1	-1	3	7	4
15	2	4	2	1	3	2
16	1	0	-1	2	9	7
17	2	3	1	0	6	6
18	2	2	0	0	4	4
19	2	5	3	2	9	7
20	2	3	1	0	6	6
21	2	5	3	0	5	5
22	3	5	2	1	4	3
23	2	1	-1	0	4	4
24	2	1	-1	0	5	5
25	3	4	1	0	4	4
26	3	2	-1	1	4	3
27	3	5	2	0	3	3
28	0	4	4	5	7	2
29	2	5	3	1	9	8
30	2	1	-1	3	9	6
31	2	3	1	2	7	5
32	3	2	-1	5	9	4
total	72	92	20	39	168	129
students	32	32	32	32	32	32

From the table, we can see the increments of the scores of the control group and the sample group. The increments of the scores of the sample group was higher but we still need to use two-tailed T-Test to confirm if there is really a significant difference between the means of the two groups.

TABLE 2: THE T-TEST RESULTS

	Variable 1	*Variable 2*
Mean	0.625	4.03125
Variance	2.822580645	4.160282258
Observations	32	32
Hypothesized Mean Difference	0	
df	60	
t Stat	-7.291800046	
P(T<=t) one-tail	3.97219E-10	
t Critical one-tail	1.670648865	
P(T<=t) two-tail	7.94438E-10	
t Critical two-tail	2.000297822	

Based on the results of the two-tailed T-Test, there is a significant difference between the means of the increments of the two groups because t Stat -.7291800046 is less than the - t Critical which is equal to -2.000297822.

TABLE 3: ITEM ANALYSIS

	FREQUENCY OF CORRECT RESPONSES			
item no.	Control Group (PRETEST)	Sample Group (PRETEST)	Control Group (POST TEST)	Sample Group (POST TEST)
1	25	8	17	24
2	28	10	24	26
3	19	14	15	23
4	0	2	2	25
5	0	5	1	3
6	0	0	16	16
7	0	0	0	9
8	0	0	10	18
9	0	0	7	15
10	0	0	0	9
TOTAL	72	39	92	168

The table shows the following findings:

1. Most of the students from the control group and sample group were able to answer the items 1 to 2 (monomial by polynomials).
2. More students from the sample group than the control group were able to answer items 3 and 4 (binomial by binomial).
3. More students from the sample group were able to answer the items with larger number of terms, specially the 4x4 polynomials wherein no student from the control group were able to answer and 9 students from the sample group answered correctly.

8.CONCLUSION

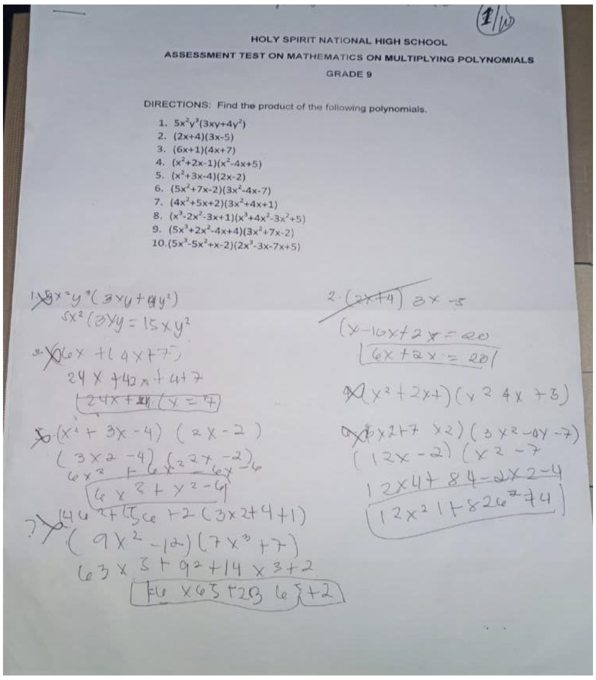
Introducing the box or Lattice method enhanced the competencies of the grade 9 students of Holy Spirit National High School in multiplying polynomials.

RECOMMENDATIONS

1. The researchers therefore recommend that the Box or Lattice method of multiplying polynomials be introduced to all the Grade 9 students of Holy Spirit National High School.
2. The researchers further recommend that studies about the effectiveness of introducing the Box or Lattice method to other grade levels in High School be conducted.

APPENDICES

PRE-TEST



HOLY SPIRIT NATIONAL HIGH SCHOOL

ASSESSMENT TEST ON MATHEMATICS ON MULTIPLYING POLYNOMIALS

GRADE 9

DIRECTIONS: Find the product of the following polynomials.

1. $5x^2y^3(3xy+4y^2)$
2. $(2x+4)(3x-5)$
3. $(6x+1)(4x+7)$
4. $(x^2+2x-1)(x^2-4x+5)$
5. $(x^2+3x-4)(2x-2)$
6. $(5x^2+7x-2)(3x^2-4x-7)$
7. $(4x^2+5x+2)(3x^2+4x+1)$
8. $(x^3-2x^2-3x+1)(x^3+4x^2-3x^2+5)$
9. $(5x^3+2x^2-4x+4)(3x^2+7x-2)$
10. $(5x^3-5x^2+x-2)(2x^3-3x-7x+5)$

POST TEST