

**The Effectiveness of Using Graphing Calculators on the Achievement  
of the Senior Students of Pasay City West High School,  
School Year 2004-2005**

**An Action Research Presented to the  
First National ICT- Education Congress**

**By**

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**and**

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## **ACKNOWLEDGEMENT**

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**Pasay City West High School**

**Mathematics Department**

**The Faculty**

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**Department Head**

**Mathematics Department**

### **Consultants**

**Dr. Myrna A. Sarmiento**

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- Situation:** Poor achievement of the senior students in Mathematics 4
- Problem:** Majority of the senior students lack interest in studying Mathematics 4
- Action Taken:** The Mathematics teachers resolved to conduct a study that will arouse the interest of senior students in studying Mathematics 4.

**Background of the Study**

The abrupt change in the grading system of the Philippine Education in the elementary and high school caused problems and bewilderment to thousands of students, teachers and parents. In Pasay City West High School, thousands of students are still not adjusted to the kind of grading system the Department of Education wants and requires. In Mathematics alone, there was a remarkable number of failing grades of students in all year levels during the first grading period. This is an alarming situation to both the Mathematics Department and the School Administration.

Interviews conducted to students and teachers were validated and weighed so as to justify the students' poor performance in Mathematics. The following are the factors used for validating and weighing:

1. socio- economic status of the family
2. unavailability of text books
3. substandard size of classroom
4. class-size of 70-75 students per class
5. poor classroom lighting and ventilation facilities
6. lack of interest in the subject matter

## **Proposal of Teachers**

### **Identify the Problem**

Primarily, the math teachers identified the various causes that contributed to the students' poor performance in Mathematics.

### **Problem Analysis and Data Gathering**

The scope of the problem was focus on the fourth year students for several reasons. Majority of the Mathematics 4 teachers admitted that the socio economic status of their students affected their class attendance, which in turn affected their classroom performance. Mr. Rosales and Mrs. Dejasco negated the fact since they have students with higher number of absences yet performed better than those with lesser number of absences. They in turn pointed that the lack of interest in the subject matter caused their poor performance in Mathematics, as confirmed by their students, too.

Miss Salvio and Miss Mercado voiced out that the unavailability of textbooks affected their student's performance but Mr. Rosales and Mr. Quizon did not agree as they have been teaching Mathematics 4 for several years now without textbooks but their students are doing well anyway. They then all confirmed that their students felt bored of the manner their instructions in Mathematics 4 were carried out. Thus, they lack interest in studying Mathematics.

Some 4<sup>th</sup> year Mathematics teachers also observed that the poor ventilation and lighting facility and over crowded room contributed to their student's poor performance in Mathematics. However, other teachers proved though they have crowded students in some rooms yet, they performed better than those students in spacious rooms. Again, they agreed that the lack of interest of their students in Mathematics 4 became the bottom line why the seniors achieved poorly in Mathematics 4.

The following were the students' justifications why they were indifferent in studying Mathematics 4:

1. difficulty of the topic
2. negative attitude toward the subject
3. boredom due to the means / procedure used in teaching Mathematics

The researchers found a way to help the senior students by means of applying modern technology-that is, by using graphing calculators in their class instructions. Somehow, this is a way of propagating knowledgeable future college students by next school year using graphing calculators.

On the other hand, the Pasay City West High School is very proud to have Mr. Arthur Quizon of the Mathematics Department headed by Mrs. Leonila M. Natividad for producing a new breed of champions during the recently concluded First Casio Graphic Calculator Contest. To express his gratitude for his exemplary achievement, he wanted to share his expertise to all the senior students not only those who excel in Mathematics 4 but most of all those who need it as a means to understand and learn more in Mathematics .

Therefore, to make this a reality, hand in hand, the Pasay City West High School Mathematics Department resolved to conduct a research on how effective graphing calculators could be to the senior students if it will be used as an aid in studying Mathematics. Will they perform better in Mathematics with the help of modern technology?

### **Formulating Hypothesis**

If the lack of interest in studying Mathematics was the reason of having low performance of the seniors in Mathematics 4, then these students could be inspired to study more by using graphing calculators that will aid them and hasten their computations in their lesson involving graphs.

### **Experimentation and Action**

#### **A. Subjects of the Study**

The subjects of the study were the 40 senior high school students.

Each senior Mathematics teacher chose two student representatives from every section they handle so that the 4<sup>th</sup> year level population is well represented for this experimentation.

Table 1 show all the sections in the 4<sup>th</sup> year and their respective teachers in Mathematics, the chosen 2 student representatives indicating their grades in Mathematics 4.

**Table 1****Student Representatives per Section as Determined by Their Respective Math Teachers**

<b>Section</b>	<b>Teacher</b>	<b>Student Representatives</b>	<b>First Quarter Grade</b>
IV- Rizal	Mr. A. Quizon	Pinca, Anne Christine	81
		Isorena, Airen May	81
IV- Del Pilar	Mr. A. Quizon	Payuhan, Jhon	78
		Piczon, Editho Jr.	78
IV- Agoncillo	Mrs. E. Dejasco	Burgos, Allain	72
		Bobiles, Michael	72
IV- Apacible	Mr. D. Rosales	Tidoso Marjo	72
		Alejandro, Genny	72
IV- Arellano	Mrs. E. Dejasco	Abonitalla, Joshua	70
		Tejome, Amor-Eli	70
IV- Burgos	Miss R. Salvio	Llauderres, Mherlita	76
		Legaste, Antonette	76
IV- Dagohoy	Mrs. E. Dejasco	Tumamak, Ramir	70
		Manguerra, Princess	70
IV- Evangelista	Miss A. Mercado	Espedido, John Ray	74
		Bucayo, Raymond	74
IV- Guerrero	Miss R. Salvio	Pastolero, Josephine	75
		Pardo, Krissel	75
IV- Jacinto	Miss A. Mercado	Camarines, Chovie	73
		Carrasco, Apple Pia	73
IV- Jaena	Miss A. Mercado	Brusola, Cherry	73
		Valerio, Brundle	73
IV- Lapu-Lapu	Mr. D. Rosales	Atila, Katherine	73
		Bautista, Anthony Jr.	73
IV- Luna	Mrs. E. Dejasco	Manarang, daryl	70
		Borcelis, Gilline Mae	70
IV- Mabini	Miss A. Mercado	Declaro, Karen	74
		Rabasto, Joan	74
IV- Paez	Mr. D. Rosales	Vale, Larry Mark	76
		Celendro, Katrina May	76
IV- Palma	Mrs. E. Dejasco	De la Llana, Richard Louie	70
		Mangubat, Michelle	70
IV- Paterno	Mr. D. Rosales	Rebugio, Judilyn	72
		Gaduina, Charlene	72
IV- Ponce	Miss R. Salvio	Morano, Rhena Camille	75
		Victorio, Viobelyn	75
IV- Ricarte	Miss R. Salvio	Pacumbaba, Liza	75
		Narciso, Mary Jane	75
IV- Silang	Miss A. Mercado	Alejandro, Garland	74
		Mangubat, Marlon	74

## B. Research Method and Design

The study was conducted from October 11-21, 2004, using the experimental method of research.

The 40 students were grouped into two. The first group was the controlled group whose class instruction followed the traditional chalk-talk-board method. The second group was the experimental group whose class instruction used with the aid of graphing calculators.

Table II shows how the grouping was done. Each section had one student representative for each group. The controlled group had equal mean grade as the experimental group to assure impartiality in this research.

**Table 2**

**Student Representative Per Section and Their First Quarter Grade in Their Respective Grouping**

Section	Controlled Group		Experimental Group	
	Student	First Quarter Grade	Student	First Quarter Grade
IV- Rizal	Pinca, Anne Christine	81	Isorena, Airen May	81
IV- Del Pilar	Payuhan, Jhon	78	Piczon, Editho Jr.	78
IV- Agoncillo	Burgos, Allain	72	Bobiles, Michael	72
IV- Apacible	Tidoso Marjo	72	Alejandro, Genny	72
IV- Arellano	Abonitalla, Joshua	70	Tejome, Amor-Eli	70
IV- Burgos	Llauderer, Mherlita	76	Legaste, Antonette	76
IV- Dagohoy	Tumamak, Ramir	70	Manguerra, Princess	70
IV- Evangelista	Espedido, John Ray	74	Bucayo, Raymond	74
IV- Guerrero	Pastolero, Josephine	75	Pardo, Krissel	75
IV- Jacinto	Camarines, Chovie	73	Carrasco, Apple Pia	73
IV- Jaena	Brusola, Cherry	73	Valerio, Brundle	73
IV- Lapu-Lapu	Atila, Katherine	73	Bautista, Anthony Jr.	73
IV- Luna	Manarang, Daryl	70	Borcelis, Gilline Mae	70
IV- Mabini	Declaro, Karen	74	Rabasto, Joan	74
IV- Paez	Vale, Larry Mark	76	Celendro, Katrina May	76
IV- Palma	Dela Llana, Richard Louie	70	Mangubat, Michelle	70
IV- Paterno	Rebugio, Judilyn	72	Gaduina, Charlene	72
IV- Ponce	Morano, Rhena Camille	75	Victorio, Viobelyn	75
IV- Ricarte	Pacumbaba, Liza	75	Narciso, Mary Jane	75
IV- Silang	Alejandro, Garland	74	Mangubat, Marlon	74
<b>Average</b>		<b>73.65</b>		<b>73.65</b>

### C. Evaluative Instrument

A teacher made test was conducted to the 40 student sample before and after the time frame of this research, to evaluate how effective was the use of graphing calculators in increasing the interest of the seniors in studying Mathematics 4.

### B. Statistical Treatment

The pre-test and post- test results were statistically analyzed and interpreted by subjecting it to t- test. The formula used was

where

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$
$$t = \frac{\bar{X}_3 - \bar{X}_4}{\sqrt{\frac{S_3^2}{N_1} + \frac{S_4^2}{N_2}}}$$

t = t- test

$\bar{x}_1$  = Pre- test Mean of the Experimental Group

$\bar{x}_2$  = Pre- test Mean of the Controlled Group

$\bar{x}_3$  = Post- test Mean of the Experimental Group

$\bar{x}_4$  = Post- test Mean of the Controlled Group

$S_1$  = Standard Deviation of Pre-Test of the Experimental Group

$S_2$  = Standard Deviation of Pre-Test of the Controlled Group

$S_3$  = Standard Deviation of Post-Test of the Experimental Group

$S_4$  = Standard Deviation of Post-Test of the Controlled Group

$N_1$  = Total Number of Respondents in the Experimental Group

$N_2$  = Total Number of Respondents in the Controlled Group

### Presentation, Analysis and Interpretation

The pre-test and post-test results were the most indispensable factors in measuring the effectiveness of using graphing calculators in arousing the interest of the seniors in studying Mathematics 4.

Table III shows the pre-test and post-test scores of the students. Right below each group is the computed mean of each test.

**Table 3**  
**Pre- test and Post-test Scores of the Members of the**  
**Controlled Group and Experimental Group**

Controlled Group			Experimental Group		
Student	Score		Student	Score	
	Pre-test	Post-test		Pre-test	Post-test
Pinca, Anne Christine	11	25	Isorena, Airen May	5	22
Payuhan, Jhon	8	6	Piczon, Editho Jr.	8	11
Burgos, Allain	10	4	Bobiles, Michael	7	22
Tidoso Marjo	8	9	Alejandro, Genny	6	12
Abonitalla, Joshua	11	9	Tejome, Amor-Eli	7	9
Llauderer, Mherlita	9	9	Legaste, Antonette	10	24
Tumamak, Ramir	9	9	Manguerra, Princess	11	23
Espedido, John Ray	9	6	Bucayo, Raymond	12	27
Pastolero, Josephine	8	8	Pardo, Krissel	8	29
Camarines, Chovie	4	8	Carrasco, Apple Pia	6	23
Brusola, Cherry	9	14	Valerio, Brundle	10	9
Atila, Katherine	8	12	Bautista, Anthony Jr.	6	12
Manarang, Daryl	5	14	Borcelis, Gilline Mae	7	14
Declaro, Karen	9	10	Rabasto, Joan	3	19
Vale, Larry Mark	7	13	Celendro, Katrina May	8	20
Dela Llana, Richard Louie	4	9	Mangubat, Michelle	8	24
Rebugio, Judilyn	8	6	Gaduina, Charlene	15	11
Morano, Rhena Camille	12	14	Victorio, Viobelyn	5	8
Pacumbaba, Liza	6	15	Narciso, Mary Jane	10	18
Alejandro, Garland	4	11	Mangubat, Marlon	11	18
<b>Mean</b>	<b>7.95</b>	<b>10.55</b>	<b>Mean</b>	<b>8.15</b>	<b>17.75</b>
<b>Standard Deviation</b>	<b>2.35</b>	<b>4.61</b>	<b>Standard Deviation</b>	<b>2.83</b>	<b>6.52</b>

**Table 4.1**

**T- test Computations of the Pre-test and Post-test Between the Controlled Group and the Experimental Group**

Test	Experimental Group	Controlled Group	Mean Difference	T.V.	P.V.	T & P Relation	Interpretation
Pre-test	8.15	7.95	0.1	0.243	0.80934	<	There is no significant difference.
Post-test	17.75	10.55	7.2	4.03	0.000255	>	Have significant difference

Base on Table 4.1, the t -value for the pre-test of the two groups yielded 0.243 which is less than the p-value of 0.809 then it can be concluded that there was no significant difference in their mean scores in the pre-test.

The t- value for the post-test of the two groups was 4.03. Comparing it to its p-value of 0.0000005, t is less than p, so, it can be concluded that there was a significant difference of their mean scores in the post -test.

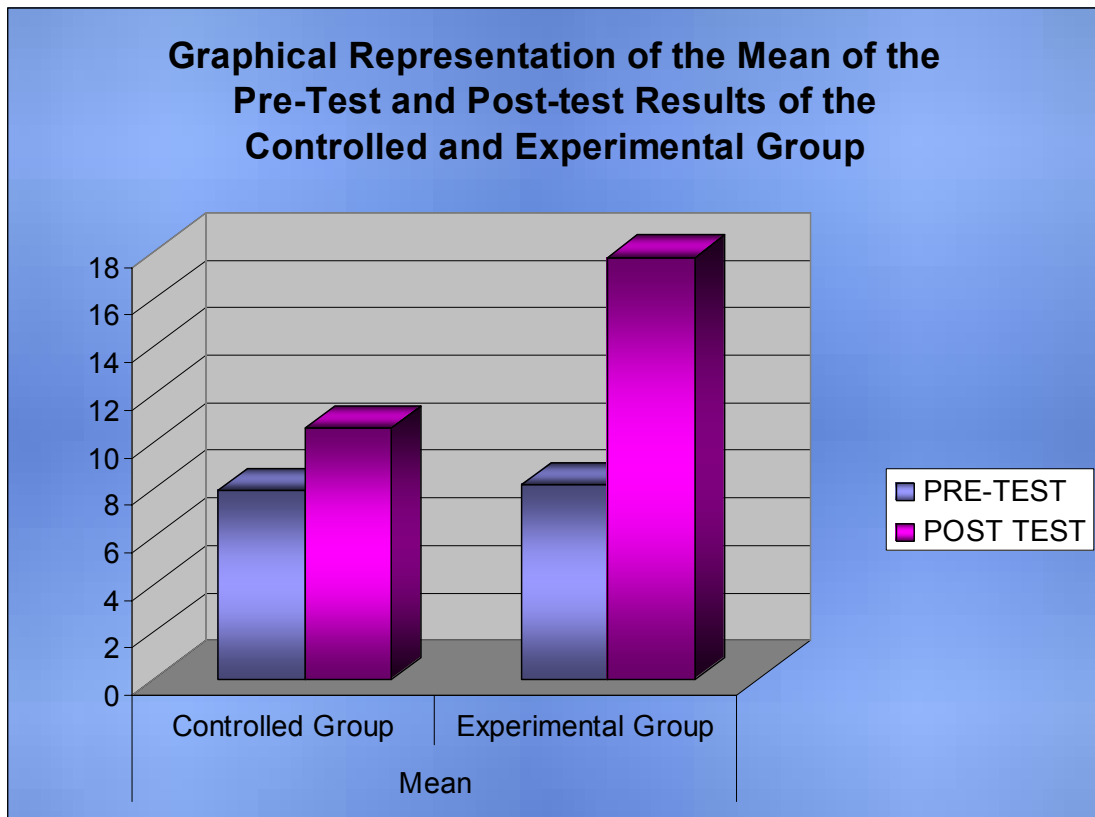
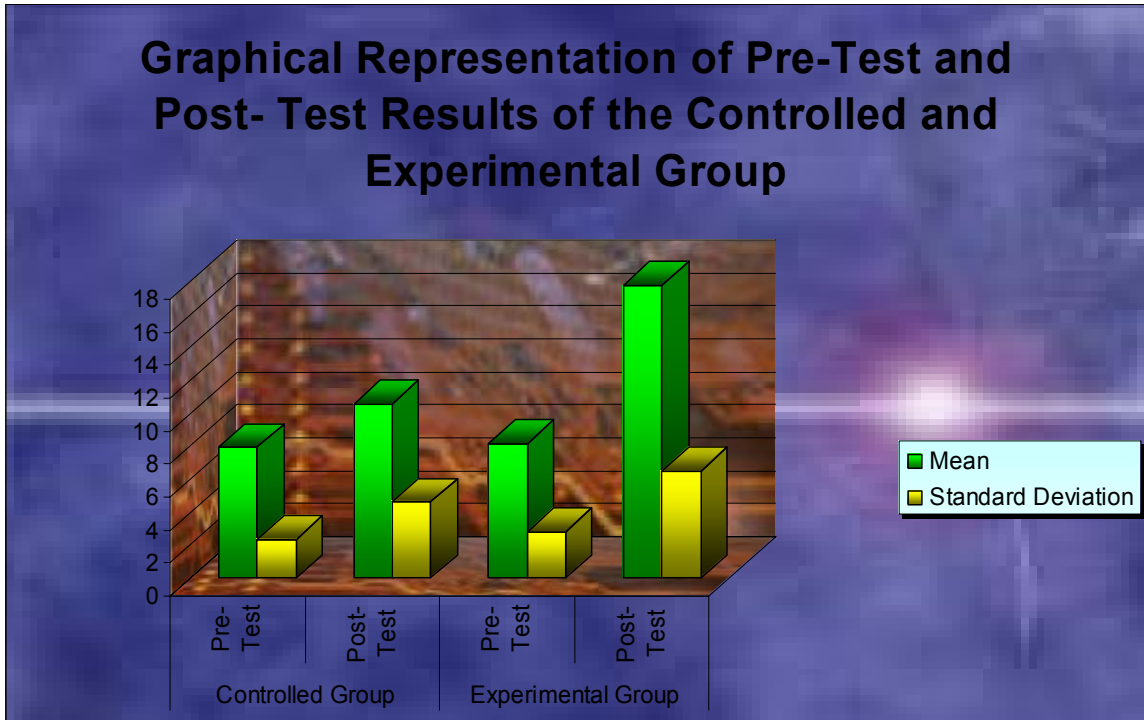
**Table IV. 2**

**T- test Computations Between the Pre-test and Post-test of the Controlled Group and the Experimental Group**

Group	Pre -Test		Post-Test		Mean Difference	T.V.	P.V.	T & P Relation	Interpretation
	Mean	SD	Mean	SD					
Controlled Group	7.95	2.35	10.55	4.61	2.60	2.25	0.030394	>	Have significant difference
Experimental Group	8.15	2.83	17.75	6.52	9.60	6.04	0.0000005	>	Have significant difference

Analyzing how well each group performed, the t-value of the pre-test and post-test of the controlled group was 2.25 which is greater than the p-value of 0.030394. It can be concluded that in the controlled group there was also a significant difference of their scores in the pre-test and post-test. While on the experimental group, the t-value was 6.04 and was greater than the p-value of 0.80934. It can also be concluded that there was also a significant difference of the mean scores in the experimental group.

However, it is very obvious, though the two study groups had significant differences, the experimental group achieved more than the controlled group based on the t-value each group yielded.



## **Evaluation**

After using the graphing calculators in class instruction of the experimental group and the traditional method of instruction to the controlled group, it was out that:

- 1) The students who used graphing calculators achieved more than the students who were instructed using the traditional method as shown in their mean.
- 2) The interest of the students who used graphing calculators was aroused more than the students who merely followed the traditional method as reflected on their mean results.

## **Conclusions and Generalizations**

Based on the evaluation of this research, the following can be concluded:

- 1) The traditional method of teaching is not so much appealing to the kind of generation of students today.
- 2) The use of modern technology by using graphing calculators in class instruction tickles and stirs the interest of our students in this era.
- 3) The use of graphing calculator helps the new generation to be “connected” to the lessons thus they perform and achieve better in studying Mathematics.

## **Plan of Action**

The Pasay City West High School Mathematics Department is highly recommending to the Mathematics teacher the use of modern technology particularly using graphing calculators in their class instructions to “keep their students studying” Mathematics.

Nevertheless, the parents of the Pasay City West High School students will be informed that when graphing calculators when used as a tool in studying Mathematics arouses the interest of their children in studying Mathematics.

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## **OTHERS**

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