

# Effectiveness in Solving Quadratic Equations by Completing the Squares: With and Without Strategic Intervention Material (WAW SIM)

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## ABSTRACT

This study showed the effectiveness of solving quadratic equations by completing the square: with and without strategic intervention material (WAW SIM). The purpose of this study is to be able to enhance the skills, knowledge and make lessons more exciting for students to learn. Thirty (30) students were used as experimental and control groups, to identify the effectiveness in solving quadratic equations by completing the square the difference of mean percentage scores of pre-assessment and post-assessment of both groups was used. However, to verify if there is a significant difference between the two groups, the t-test will be performed at a 0.05 level of significance. Based on the conclusion, the variable Without SIM there was a significant difference in performance in their pre-assessment and post-assessment having a slightly higher t-test result of 9.15 than the critical value of 2.045. And it was shown from their Mean Percentage Score (MPS) that the result in post-assessment was slightly higher from 41.7% to 62%. A little increased learning but it is not an effective way of solving quadratic equations by completing the square. While the variable With SIM there was a significant difference in performance in their pre-assessment and post-assessment having a greater t-test result of 23.99 than the critical value of 2.045. And it was shown from their Mean Percentage Score (MPS) that the result in post-assessment was more than doubled from 41.7% to 89% it's a greater increase in learning and a very effective way of solving quadratic equations by completing the square.

**Keywords:** Strategic Intervention Materials (SIM), Mathematics Performance, Effectiveness, Solving Quadratic Equations.

## INTRODUCTION

Solving quadratic equations by completing the square appears to be an important learning goal in the curricula that teachers try to realize in mathematics lessons. However, it is one of the most difficult demands for students. Based on the inventory of Mathematics Teachers of Dolores National High School solving quadratic equations by completing the square is one of the least learned skills in Mathematics 9. Inquirer.net issue dated July 20, 2013, revealed that the National Achievement Test (NAT) conducted by the Department of Education National Educational Testing and Research Center (DepEd-NET) for the secondary schools had a mean percentage score (MPS) of 48.9% which is very far from the 75% goal of the Department of Education. Dolores National High School was included in this scenario, according to the school Basic Education Information System (BEIS), Monitoring and Evaluation Report (M&E) the mean percentage average score for the first quarter result of Mathematics was only 48.56%.

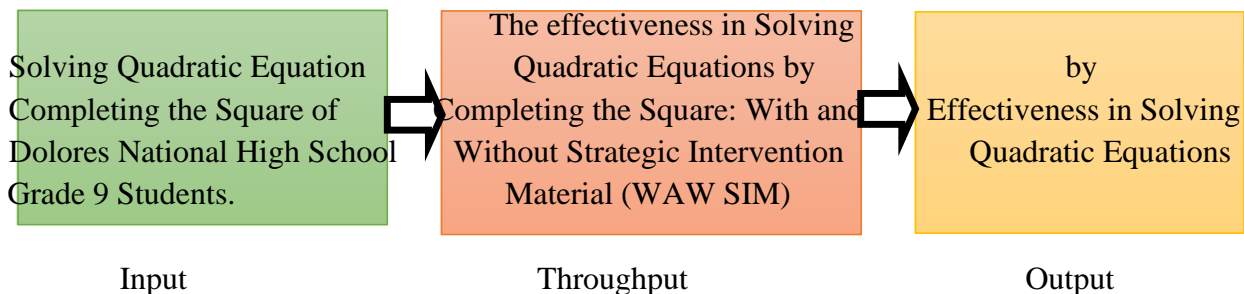
A Chinese proverb says "Tell me and I'll forget, show me and I'll remember, and Involve me and I'll learn" such a motivation of different teachers handling Mathematics classes in school coping and intervening students with love, care and hard work in studying lessons.

A Strategic Intervention Material (SIM) is an instructional material meant to reteach concepts and skills. Materials were given to learners to help them master a competency-based skill which they were not able to develop during the regular classroom teaching (with minimal intervention/guide of a teacher.) It contains a variety of activities and assessment tools that address the interest of the students according to their style and learning domain (Rodtips, 2016). In addition, the designs of the strategic intervention materials are attractive and eye-catching that is why a lot of teachers are encouraged to use for students in the teaching-learning process.

However, according to (Grace Fleming, 2018) in 2005, Gallup conducted a poll that asked students to name the school subject that they considered to be the most difficult. Not surprisingly, mathematics came out on top of the difficulty chart. Math seems difficult because it takes time and energy. Many people don't experience sufficient time to 'get' math lessons, and they fall behind as the teacher moves on. As an answer to the difficulties that the students are having during Math Classes, the researcher looks for the best way to enhance a student's knowledge and that is using Strategic Intervention Material (SIM).

The study, therefore, was conducted in order to test the effectiveness of Strategic Intervention Material in Solving Quadratic Equations by Completing the Square: with and without SIM (WAW).

### CONCEPTUAL FRAMEWORK OF THE STUDY



### OBJECTIVES OF THE STUDY

This study is sought to answer the following questions:

1. Which is effective in solving Quadratic Equations by Completing the Square?
2. Is there a significant difference between the mean scores of students based on pre-assessment and post-assessment using Strategic Intervention Material (SIM) in Solving Quadratic Equation by Completing the Square?
3. Is there a significant difference between the mean scores of students based on pre-assessment and post-assessment without using Strategic Intervention Material (SIM) in Solving Quadratic Equations by Completing the Square?
4. Is there a significant difference between the mean scores and percentage scores of students based on pre-assessment and post-assessment with and without using Strategic Intervention Material (SIM) in Solving Quadratic Equation by Completing the Square?

## RESEARCH DESIGN AND METHODS

In this study, the researcher used the experimental design in the form of pre-assessment and post-assessment. This study followed the static group comparison design of conducting experimental research. One intact group of thirty (30) students of Grade 9 were utilized. Comparisons were made between the results of the pre-assessment and post-assessment on instructional material using strategic intervention materials and without using strategic intervention materials. The pre-assessment was given to the group which assessed their prior knowledge in solving quadratic equations by completing the square using and without using strategic intervention materials. After two sessions of exposing them to strategic intervention materials, a post-assessment was administered to validate the effectiveness of solving quadratic equations by completing the square with and without using strategic intervention materials. To determine the effectiveness of solving quadratic the equation by completing the square of the respondents based on their scores before with using Strategic Intervention Material (SIM) the mean of the pre-assessment and post-assessment was calculated. To determine the effectiveness in solving the quadratic equation by completing the square of the respondents based on their scores before without using Strategic Intervention Material (SIM) the mean of the pre-assessment and post-assessment was calculated. The effectiveness of solving the quadratic equation by completing the square was determined through the difference in the mean percentage score of the pre-assessment and post-assessment of both groups with and without using Strategic Intervention Material (SIM). To verify if there is a significant difference between with and without using Strategic Intervention Material (SIM) in terms of their pre-assessment and post-assessment, the t-test will be performed at 0.05 level of significance.

## SUMMARY OF RESULTS AND DISCUSSION

### Presentation and Analysis of Data

1. Which one is effective in solving Quadratic Equations by Completing the Square?
2. Is there a significant difference between the mean scores of students based on pre-assessment and post-assessment using Strategic Intervention Material (SIM) in Solving Quadratic Equation by Completing the Square?
3. Is there a significant difference between the mean scores of students based on pre-assessment and post-assessment without using Strategic Intervention Material (SIM) in Solving Quadratic Equation by Completing the Square?
4. Is there a significant difference between the mean scores and percentage scores of students based on pre-assessment and post-assessment with and without using Strategic Intervention Material (SIM) in Solving Quadratic Equation by Completing the Square?

The data gathered in the study are presented through a tabular presentation.

### With Using Strategic Intervention Material

*Table 1. Summary Result of the scores in pre-assessment and post-assessment with using SIM.*

Student	Score in Pre-Assessment	Score in Post-Assessment
1	4	9
2	4	10
3	3	8

4	3	9
5	4	10
6	5	9
7	4	8
8	3	8
9	4	10
10	5	10
11	5	9
12	4	8
13	3	9
14	4	9
15	4	9
16	3	8
17	5	9
18	4	8
19	6	10
20	4	8
21	4	8
22	3	9
23	5	9
24	5	10
25	4	8
26	4	8
27	3	9
28	8	10
29	7	10
30	1	8
<b>Total</b>	<b>125</b>	<b>267</b>

As shown in Table 1, Summary Result of the Effectiveness of using Solving Quadratic Equation by Completing the Square pre-assessment total score of 125 and post-assessment with a total score of 267.

**Table 2.** *The t-test on the Significant Difference between the Pre-Assessment and Post -Assessment Results with using Strategic Intervention Material.*

Variable	T - Value	Critical Value	Decision	Interpretation
Pre-Assessment VS Post-Assessment	23.99	2.045	Reject H <sub>0</sub>	Significant

N = 30

Level of Significance (α = .05)

As shown in Table 2, Based on the result, there was a significant difference between the pre-assessment and the post-assessment since the computed value in the t-test dependent samples was 23.99

and greater than the critical value which was 2.045 using a two-tailed test since the hypothesis was non-directional. It means that the use of SIM in SQE by completing the square was significant and an effective increase in learning the lesson.

**Table 3. Mean Difference Score**

Mean Score of Pre-Assessment	Mean Score of Post-Assessment	DIFFERENCE
4.17	8.90	4.73

**Table 4. Mean Percentage Score**

MPS of Pre-Assessment	MPS of Post-Assessment	Difference of MPS	Interpretation
41.7%	89%	47.3%	Very Effective

Before the utilization of the Strategic Intervention Material (SIM) in Solving Quadratic Equation by Completing the Square, the learning effectiveness level of Grade 9 selected students was 41.7 % MPS below mastery level.

After the utilization of the Strategic Intervention Material (SIM) in Solving Quadratic Equation by Completing the Square, the learning effectiveness level of Grade 9 students were 89% MPS and the interpretation is very effective in learning SIM SQE by completing the square it is above the mastery level. Furthermore, the MPS of Post-Assessment was much higher than the Pre-Assessment with a Total Difference of 47.3% MPS.

**Without Using Strategic Intervention Material**

**Table 5. Summary Result of the scores in pre-assessment and post-assessment without using SIM.**

Student	Score in Pre-Assessment	Score in Post-Assessment
1	4	5
2	4	6
3	3	5
4	3	5
5	4	6
6	5	7
7	4	6
8	3	7
9	4	7
10	5	7
11	5	7
12	4	6
13	3	7

14	4	5
15	4	7
16	3	5
17	5	7
18	4	6
19	6	7
20	4	7
21	4	5
22	3	6
23	5	7
24	5	5
25	4	5
26	4	6
27	3	4
28	8	8
29	7	8
30	1	7
<b>Total</b>	<b>125</b>	<b>186</b>

As shown in Table 5, The Summary Result of the Effectiveness of Without using Solving Quadratic Equations by Completing the Square Pre-Assessment total score of 125 and the Post-Assessment with a total score of 186.

**Table 6.** *T-Test on the Significant Difference between the Pre-Assessment and Post Assessment Results without using Strategic Intervention Material.*

Variable	T - Value	Critical Value	Decision	Interpretation
Pre-Assessment VS Post-Assessment	9.15	2.045	Reject H <sub>0</sub>	Significant

N = 30

Level of Significance (α = .05)

As shown in Table 6, Based on the result, there was a significant difference between the pre-assessment and the post-assessment since the computed value in the t-test dependent samples was 9.15 and greater than the critical value which was 2.045 using a two-tailed test since the hypothesis was non-directional. It means that with the use of SIM in SQE by completing the square there was a significant and slightly effective increase of learning in the lesson.

**Table 7. Mean Difference Score**

Mean Score of Pre-Assessment	Mean Score of Post-Assessment	DIFFERENCE
4.17	6.20	2.03

**Table 8. Mean Percentage Score**

MPS of Pre-Assessment	MPS of Post-Assessment	Difference of MPS	Interpretation
41.7%	62%	20.3%	Not Effective

After without using the Strategic Intervention Material (SIM) in Solving Quadratic Equation by Completing the Square, the learning effectiveness level of Grade 9 students were 62% MPS and the interpretation is Not effective in learning SIM SQE by Completing the Square it is below the mastery level. Furthermore, the MPS of post-assessment was slightly higher than the pre-assessment with a total difference of 20.3% MPS.

**Summary of comparison between the two variables**

Variable	PreAsses sment	Post - Asses sment	Mean Score (Pre)	MPS (Pre)	Mean Score (Post)	MPS (Pos t)	Differen ce MPS (PrePost)	T - Valu e	Interpretati on	Interpretati on
<b>With SIM</b>	125	267	4.17	41.7%	8.90	89%	47.3%	23.99	Significant	Very Effective
<b>Without SIM</b>	125	186	4.17	41.7%	6.20	62%	20.3%	9.15	Significant	Not Effective

Based on the summary of the variable With SIM there was a significant difference in performance in their pre-assessment and post-assessment having a greater T-test result of 23.99 than the critical value of 2.045. And it was shown from their Mean Percentage Score (MPS) that their result in post-assessment was more than doubled from 41.7% to 89%. A greater increase in learning and a very effective way of solving quadratic equations by completing the square. While the variable Without SIM, there was a significant difference in performance in their pre-assessment and post-assessment having a slightly higher T-test result of 9.15 than the critical value of 2.045. And it was shown from their Mean Percentage Score (MPS) that their result in post-assessment was slightly higher from 41.7% to 62%. A little increased learning but it is not an effective way of solving quadratic equations by completing the square.

## CONCLUSIONS

Specifically, the following conclusions were drawn:

1. There was a significant difference in performance in their pre-assessment and post-assessment with the use of SIM in solving quadratic equations by completing the square.
2. A greater increased level of learning, the respondents perform better and very effective way during the post-assessment after using the Strategic Intervention Material (SIM) in solving quadratic equations by completing the square.

3. There was a significant difference in performance in their pre-assessment and post-assessment having a slightly higher T-test result of 9.15 than the critical value of 2.045 without the use of SIM in solving quadratic equations by completing the square.
4. A little increase in learning but it's not an effective way during post-assessment without using the Strategic Intervention Material (SIM) in solving quadratic equations by completing the square.
5. With the use of Strategic Intervention Material (SIM) in solving quadratic equations by completing the square is more effective way than without using it because the respondents easily learned, and master a lesson within an hour, making some fun and exciting way in acquiring knowledge from Strategic Intervention Material (SIM).

## RECOMMENDATIONS

Based on the results of the study, the following recommendations were given:

1. Further analysis should be conducted to determine the effectiveness of solving quadratic equations by completing the square with and without using strategic intervention materials.
2. It is recommended that follow-up research will be conducted with different factors from this study;
3. The researcher recommends this study to mathematics teachers having difficulty in solving quadratic equations by completing the square, to consider the use of strategic intervention materials in solving quadratic equations by completing the square;
4. It is highly recommended that all teachers who are willing to share their knowledge must be developed more strategic intervention materials for the remaining lessons which were not included in the researcher's SIMs.
5. Further research should be conducted on similar topics to verify and nullify for its own improvement.

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