

## **Error analysis for grade IX students in completing the materials of quadratic equation**

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**Abstract:** The objective of the study is to discover: (1) types of errors that the students have committed; (2) the obstacles that the students have dealt with; and (3) the size of the errors that the students have committed. The nature of the study is qualitative and quantitative research. Then, within the conduct of the study the research site was the Angkasa Adisucipto Junior High School located in Janti Street, Adisucipto Air Base, Caturtunggal, Depok, Yogyakarta. The subjects within the study were the students from Grade IX A, Grade IX B and Grade IX C from the Angkasa Adisucipto Junior High School Yogyakarta. The data were gathered by using test administration, questionnaire distribution and documentation study. Then, the instruments that had been implemented within the conduct of the study were the essay test instrument and the questionnaire. The results of the study show that the errors that the Grade IX students from Angkasa Adisucipto Junior High School in completing the materials of Quadratic Equation from the perspective of concept understanding are namely: (1) the students have not correctly formulated the mathematical concepts by using the appropriate symbol or language; (2) the students have committed errors in composing the theorem or formula (whereas it has not been demanded in the test items); (3) the students have committed errors in composing the ABC formula when they are completing the test items; and (4) the students have not composed the theorem or the formula for completing the test items. Then, the five biggest obstacles in learning the materials of Quadratic Equation are namely: (1) classroom (64.06%); (2) students' capacity (46.25%); (3) material delivery (30.07%); (4) students' attitude and interest toward the materials of Quadratic Equation (29.24%); and (5) students' motivation (25.78%).

**Keywords:** Errors, Quadratic Equation, concept, counting skills

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### **INTRODUCTION**

Education is a universal phenomenon and lasts throughout the course of the human beings' life everywhere. According to Philip, education in a wide sense means to learn (Sumitro, 2006, p.16). Nowadays, it has been more realized that education holds an important role in the life and the advancement of mankind. With regards to the statement, Budiarti & Jailani (2014, p.28) education also has a very decisive role for the development and the manifestation of individuals especially for the state and the nation development.

In the efforts of improving the educational quality, specifically for Mathematics, the educators or the teachers are demanded to always improve themselves both in terms of mathematical background knowledge and in terms of teaching-learning process management. The improvement is intended to facilitate the students in learning Mathematics through a good and appropriate manner so that the students will be able to keep up with the development of science and technology and will also be able to implement the principles of science and technology in the daily life. According to Muginah & Widjajanti (2014, p.165), in order to master and develop the technology in the future, there should be strong mathematical internalization as early as possible. Therefore, Mathematics should be taught to all students from the elementary school grade in order to equip the students with the logical, analytical, systematic, critical and creative thinking skills altogether with the cooperation skills. These skills are necessary for the students so that the students might internalize the capacities of attaining, managing and benefitting information for surviving in the always changing, uncertain and competitive situations (Amin & Suardiman, 2016, p.13).

Mathematics is the source of other discipline of science. However, in the reality many people regard Mathematics as the most difficult discipline (Abdurrahman, 2012, p.202). The statement might be traced back into the mathematical learning achievements that have still been low among the Junior High School students. The low score that the Junior High School students have in Mathematics can be one of the clues with regards to the incapability of the students in completing the mathematical test items. In the same time, the low scores have been more apparent in the errors that the students have committed when they have completed the mathematical test items. The errors that the students have committed in completing the mathematical test items indicate the presence of the low capacity in concept mastery that the students have. The students' weakness in the mathematical concept mastery might cause them to suffer from difficulties in dealing with the mathematical test items. Similar situation has been suggested by Soedjadi (1999, p.27), who states that the difficulties that the students have might cause errors within the test administration. The relationship between the errors and the difficulties might be highlighted in the following sentence: "If someone has difficulties then he will commit errors."

The students' difficulties in learning Mathematics should be solved as early as possible (Abdurrahman, 2003, p.251). Therefore, the students' difficulties in learning Mathematics should be identified by the teachers. The parts of Mathematics that have caused difficulties among the students should be notified in order to find the cause of the difficulties. After the cause has been found, the cause should be mended in order that the students will have better understanding and thus they will be able to complete the mathematical test items well. Based on the results of the report in the Percentage of Mathematics National Examination Test Item Mastery in the Junior High School/Islamic Junior High School Degree held in Angkasa Adisucipto Junior High School, the latest condition of the absorption capacity within the Quadratic Equation for the materials of Algebra-Form Factorial has been 50.54 for the Academic Year 2010/2011 and 55.24 for the Academic Year 2011/2012. This absorption capacity is still low and it indicates that the students still suffer from numerous learning obstacles and difficulties. These difficulties might be viewed from the errors that the students commit when they try to complete the quadratic equation test items. In addition, the empirical data of several studies indicate that the capacity of the Indonesian students in Mathematics and Science has still been low (Retnawati & Kartowagiran, 2016, p.162).

Several Mathematics teachers in the field has been busy with the routines of their daily duties. In the same time, the pursuance of material internalization for the immediate conduct of the test/examination has made the teachers forget to conduct error analysis for the Grade IX students within the learning process. Several teachers in fact have gained less scientific reviews in relation to the approaches for viewing the errors that the students commit, mainly with regards to the materials of Quadratic Equation. The teachers have not identified the size of the errors that the students have committed, especially in the case of Angkasa Adisucipto Junior High School, in completing the materials of Quadratic Equation. In addition, the students have not also identified the size of the obstacles that the students in the Angkasa Adisucipto Junior High School should deal with in learning the materials of Quadratic Equation from the perspective of teachers, students and facilities. Not to mention, several teachers have also gained less scientific reviews in relation to the efforts of solving the errors in completing the materials of Quadratic Equation.

The students' errors in understanding the concept of Quadratic Equation will cause difficulties in learning the subsequent concepts. The students' errors should not be regarded as a common phenomenon for Mathematics. Instead, the students' errors should be solved and not avoided since avoiding the students' errors will lead to similar or even exactly the same difficulties. Over the time, the students' difficulties might expand and thus might not be solved at all. Departing from the given situation, the researcher is highly compelled to analyse the errors that the Grade XI students of Angkasa Adisucipto Junior High School have committed in completing the materials of Quadratic Equation and the efforts of solving the difficulties in order to avoid the occurrence of similar errors so that the students might be avoided from committing the similar errors might be found especially with regards to the mathematical learning process in the materials of Quadratic Equation. In the same time, through the conduct of the study it is

expected that the size of both the students' errors and the students' obstacles in learning and completing the materials of Quadratic Equation might be found.

Thorndike (Santrock, 2014, p.4) argues that one of the most important tasks in the school is to exercise the students' thinking skills and to gain competitive edge in encouraging the scientific study toward the teaching-learning process. In relation to the argument, Haylock & Thangata (2007, p.27) state that learning concept refers to the process in which a student organizes his or her learning experiences, abstract from a number of general exercises and makes use of one of the concepts for concluding all of his or her learning activities. Reyes et al. (Runtukahu & Kandou, 2014, p.28) state that Mathematics refers to the study of pattern and relationship, thinking skills by means of organizational strategy, analysis and synthesis, art, language and tools for solving abstract and practical problems. Similarly, Van, Walle & Williams (2010, p.13) state that Mathematics refers to the science of pattern and sequence. On the other hand, Steen (Nickerson, 2010, p.3) states that Mathematics refers to the science of investigation that strives to understand all types of patterns namely the pattern in the nature, the pattern that has been created by human's mind and the pattern that has been created by the mind of other beings. Despite the conflicting arguments, Sarama & Clements (2009, p.2) further states that Mathematics has three important parts namely: (1) the learning objectives that should be achieved; (2) the development that the students should pursue and (3) the set of learning assignments or activities that are in accordance to the thinking levels of the students in their developmental period. The three important parts will assist the students in developing their thinking skills to the next level.

As having been implied, learning difficulties are a symptom that has been apparent among the students with low learning achievement as its main characteristic. According to Abdurrahman (Runtukahu & Kandou, 2014, p.21), in general the teachers view the students who have low learning achievement as the student who suffer from learning difficulties. With regards to the statement, the Individual with Disabilities Education Improvement Act (IDEA) (Lerner, 2006, p.476) states that the students' learning difficulties in Mathematics lie in two aspects namely: (1) mathematical counting; and (2) mathematical reasoning. These difficulties might interrupt the students' learning achievement in the school and the students' success in the future life. According to Westwood (2009, p.1), learning difficulties refer to the obstacles that limit the access, the participation and the results in a lesson plan. In relation to the situation, Jordan (2010, pp.1-2) argues that most of the students with mathematical learning difficulties have been marked by the weakness in defining the secondary numeric symbol, which is related to whole number, number relation, number operation and irregular area which has been influenced by experiences.

One of the methods that might be afforded to solve such problem is error analysis. Error analysis consists of two words namely error and analysis. According to Suharso & Ana (2012, p.442), error refers to either fault or abandonment. Errors in the same time might also be defined as the mismatch between the expectation and the reality. In a more specific manner, White (2005, p.7) states that errors in mathematical problem solution consists of: (1) Reading Error (R), namely the type of errors that have been committed in the problem-solving activities and usually occur when the students unable to read the written keys or words within the test item question or sentence; (2) Comprehension Error (C), namely the type of errors that occur when the students have been able to read all of the words in the test-item question or sentence but do not understand the overall meaning of these words and consequently the students are unable to proceed further alongside the appropriate problem-solving sequence; (3) Transformation Error (T), namely the type of errors in which the students have been able to understand the question that should be solved but they have been unable to identify the operation or the operation sequence that will be necessary for solving the problems; (4) Process-Skills Errors (P), namely the type of errors in which the students have identified the relevant operation or the sequence of operation but they do not understand which procedures that will be relevant for implementing the mathematical operation accurately; and (5) Encoding Errors (E), namely the type of errors in which the students have appropriately solved the given problems but they are unable to define the solution in the form of appropriate and acceptable notation as a conclusion.

The students have indeed able to solve the given mathematical problems but they are unable to draw conclusions in accordance to the request of the test-item because they have inaccurately interpreted the gain. In the meantime, according to Suharso & Ana (2012, p.37), analysis refers to the investigation toward certain phenomena (composition, event and alike) in order to identify the actual situations (cause, origin and alike). On the contrary, in a more detailed manner Suwanto (2013, p.31) states that analysis refers to the activities of processing and analysing materials into parts of main elements and defining the relationship among these parts in a complete framework. Then, according to Lerner (1985, p.447-448) prior to defining the mathematical learning technique the teachers should identify the students' capability or incapability in learning Mathematics. Therefore, in order that the students do not commit any error in understanding and completing the test items that have been given, the location of the students' errors should be identified so that the similar errors will not occur anymore among the students.

With regards to the above elaboration, the objective of the study is to: (1) explain the size of the error that the students of Angkasa Adisucipto Junior High School have committed in completing the materials of Quadratic Equation; (2) explain the size of the obstacle that the students of Angkasa Adisucipto Junior High School have encountered in learning the materials of Quadratic Equation; (3) explain the types of error that the students of Angkasa Adisucipto Junior High School have committed in completing the materials of Quadratic Equation; and (4) explain the types of obstacle that the students of Angkasa Adisucipto Junior High School have encountered in completing the materials of Quadratic Equation from the factors of teachers, students and facilities. Then, the results of the study are expected to provide feedback for the Mathematics teachers with regards to the students' errors in understanding the mathematical concept and also to the students' counting errors in completing the materials of Quadratic Equation. Thus, the practical benefits that the Mathematics teachers might gain from the conduct of the study are: (1) identifying the location of the students' errors in completing the materials of Quadratic Equation so that the learning process in the incoming year might be improved and the students might be avoided from committing the similar errors; and (2) providing scientific information about the efforts that should be pursued in order to overcome the students' errors in completing the materials of Quadratic Equation. In addition, the practical benefit that the students might gain from the conduct of the study is that the students will be able to identify the location of their errors in learning the materials of Quadratic Equation so that the rate of committing the similar mistakes might be minimized. Last but not the least, the practical benefit that the future researchers might gain from the conduct of the study is that the future researchers might attain scientific experience and information with regards to the students' errors in learning the materials of Quadratic Equation. With the provision of the scientific information, it is expected that the researchers might prepare themselves better in terms of competencies as educator candidate.

## METHOD

The nature of the study was the qualitative and the quantitative research. The study was considered to have the qualitative nature because the aim of the study had been to describe the errors and the obstacles that the Grade IX Students of Angkasa Adisucipto Junior High School had in learning the materials of Quadratic Equation. On the other hand, the study was considered to have the quantitative nature because the aim of the study had also been to describe the size of the errors and the obstacles that the Grade IX students of Angkasa Adisucipto Junior High School had in learning the materials of Quadratic Equation. Then, as having been implied, the study took place in the Angkasa Adisucipto Junior High School located in Janti Strip, Adisucipto Air Base, Caturtunggal, Depok, Yogyakarta.

The population within the conduct of the study was all of the Grade IX students in the Angkasa Adisucipto Junior High School with total member 96 people from three different classrooms. Then, the samples were selected from the population by using the cluster random sampling technique since the population had been divided into three classrooms and each

classroom had the equal opportunity to be selected as the sample for the study. The composition of the population members might be described as follows: (1) Grade IX A and Grade IXB occupied 66.67% of the total population and served as the sample for the study; and (2) Grade IX C occupied 33.33% of the total population and served as the sample for the instrument test. The overall number of the sample had already met the criteria since the sample selection might cover 10-15%, 20-25% or even more of the total population. Furthermore, as having been indicated, the subjects in the study consisted of 96 respondents with the following composition: (1) 32 students were from Grade IX A; (b) 32 students were from Grade IX B; and (3) 32 students were from Grade IX C.

The variables within the conduct of the study were the size of students' errors in the Angkasa Adisucipto Junior High School with regards to the completion of Quadratic Equation materials, the description of students' errors in the Angkasa Adisucipto Junior High School with regards to the completion of Quadratic Equation Materials and the obstacles of the students in learning the materials of Quadratic Equation. The errors that had been intended in the study were the deviations toward the correct answer in the completion of each test item. The types of errors that had been given attention were the errors toward the concept understanding, which covered: (1) the students' incapability to define or select the concept that had been relevant to the test item; (2) the errors in defining the theorem or the formula for completing the test item; (3) the errors in using the theorem or the formula; (4) the incapability to formulate the mathematical concept with the appropriate language and symbol; and (6) the counting errors, which further covered: (a) the errors in manipulating the operating (operational errors); and (b) the errors in counting; and (c) the errors in elaborating. On the other hand, the obstacles that had been intended in the study were the obstacles that the students had encountered in learning the materials of Quadratic Equation. The obstacles that had been identified based on the source were related to: (1) teachers; (2) students; and (3) facilities.

The instrument that had been administered in the study were the Quadratic Equation test item and questionnaire. The Quadratic Equation test item consisted of essay-type test item that had been administered in order to gather the data about the students' errors in completing the Quadratic Equation materials from the aspect of concept mastery and counting skills. the test item itself was based on the materials of Quadratic Equation. In addition, questionnaire was also distributed in order to identify the students' obstacles in learning the concept of Quadratic Equation. The materials within the questionnaire covered the matters that interrupted the fluency of the Quadratic Equation learning process from the factors of teachers, students and facilities.

The validity of the instrument within the study was highly important in the analysis. Therefore, validity test was performed in order to identify whether the instrument that had been administered was already valid or not. According to Kelley (Warner, 2013, p.902), a measure is valid if it measures to what it purports to measure. Within the conduct of the study, the type of validity test that had been administered was the expert judgment. In addition, the estimates of instrument reliability were also performed in order to measure how far the measurement might provide the results that were relatively similar if the same measurement conducted on the same object. Warner (2013, p.901) states that a good measure should be reasonably reliable – that is, it should yield consistent results. With regards to the estimates of instrument reliability, the type of test that had been adopted in this regard was the alpha coefficient test or also known as the Cronbach's alpha (or coefficient or just alpha). According to Reynolds, Livingstone & Wilson (2010, p.103), Cronbach's alpha determines agreement of answer on question targeted to specific trait. Similarly, Gall et al. (2007, p.202) states that Cronbach's alpha coefficient can be used when items on a measure are not scored dichotomously; for example, some multiple-choice tests and essay tests include items that have several possible answers. Then, Arikunto (2006, p.196) states that the instrument reliability test for the essay-type test item and the questionnaire-type test item which score had not been 0 and 1 should adopt the alpha formula. For the conduct of the instrument reliability test, the SPSS 16.00 for Windows had been run. The results of the data analysis showed that the instrument reliability of the Quadratic Equation essay-type test item had been 0.966 while the instrument reliability of the Quadratic Equation

questionnaire had been 0.883. Based on the interpretation toward the r-price in the coefficient of correlation reliability, the reliability of the Quadratic Equation essay-type test item had been 0.966 and belonged to the "High" category whereas the reliability of the Quadratic Equation questionnaire had been 0.833 and belonged to the "High" category as well.

In line with the objective of the study, the data analysis that had been adopted in the study was the quantitative data analysis and the descriptive qualitative data analysis. The quantitative data analysis was in the form of percentage on the errors that the students had committed whereas the descriptive qualitative data analysis was in the form of data/description on the errors that the students had committed. Furthermore, the aspects that had been analysed within the conduct of the study were the aspects of concept understanding and the aspects of counting skills. In the same time, the data description was related to the errors that the students had committed in learning the Quadratic Equation.

Then, the formula that had been used in calculating the percentage of the errors that the students had committed was as follows:

$$P = \frac{\sum S}{N} \times 100\%$$

Note:

$P$  = Percentage of errors

$\sum S$  = Number of students who had committed errors

$N$  = Number of students who had been the subjects of the study

In order to identify the errors that had been inclined to be committed by most of the students, the highest percentage of each number in the test item should be viewed. Then, the formula for calculating the percentage of each factor that had caused obstacles among the students was as follows:

$$P = \frac{\sum S}{\sum A \times N} \times 100\%$$

$P$  = Percentage of errors

$\sum S$  = Number of the students who had encountered obstacles

$\sum A$  = Number of questionnaire item for each factor

$N$  = Number of students who had been the subjects of the study

In order to identify the obstacles that had been inclined to be encountered by most of the students, the highest percentage of all factors should be viewed.

## RESULTS AND DISCUSSIONS

As having been elaborated in the previous sections, the study is conducted in order to identify the errors that the Grade IX students of the Angkasa Adisucipto Junior High School in completing the test items of Quadratic Equation from the aspects of concept understanding and counting skills. With regards to the objective of the study, the overall results will be discussed further in the following sub-section.

### **Size of Errors that the Grade IX Students of Angkasa Adisucipto Junior High School Have Committed in Completing the Test Items of Quadratic Equation**

The analysis toward the 8 test items of Quadratic Equation provides the information about the number of the students who had completed the test items, the number of the students had completed the test items correctly, the number of the students who had completed the test items incorrectly, the number of the students who did not complete the test items and the number of students who had committed errors (namely the number of the students who had completed the test items incorrectly added by the number of the students who did not complete the test items). The data on the information might be consulted to Table 1.

**Table 1.** Number of Grade IX Students of Angkasa Adisucipto Junior High School Who Had Completed and Committed Errors in Completing the Materials of Quadratic Equation (N = 64)

No.	Students completing the test items		Students completing the test items correctly		Students completing the test items incorrectly		Students not completing the test items		Students committing errors	
	$\Sigma$	%	$\Sigma$	%	$\Sigma$	%	$\Sigma$	%	$\Sigma$	%
1.a	64	100.00	15	23.43	49	76.56	-	-	49	76.56
1.b	64	100.00	13	20.31	51	79.68	-	-	51	79.68
1.c	60	100.00	12	18.75	52	81.25	-	-	52	81.25
2.a	60	93.75	11	17.18	49	76.56	4	6.25	53	82.81
2.b	60	93.75	10	15.62	50	78.12	4	6.25	54	84.37
3.a	61	95.31	11	17.18	50	78.12	3	4.68	53	82.81
3.b	61	95.31	9	14.06	52	81.25	3	4.68	55	85.93
4	60	93.75	6	9.37	54	84.37	4	6.25	58	90.62

From the results in Table 1, it is found that the Grade IX students of Angkasa Adisucipto Junior High School have committed several errors in completing the test items of Quadratic Equation materials. The first error that most of these students commit has been found in the Test Item Number 4, which is related to the quadratic equation in the form of essay-type test item. The details on the first error might be elaborated as follows: (1) the total number of respondents who complete the Test Item Number 4 is 60 students or 93.75% of the total respondents; (2) the number of respondents who commit errors the Test Item Number 4 is 58 students or 90.62% of the total respondent; (3) the number of respondents who complete the Test Item Number 4 correctly is 6 students or 9.37% of the total respondents; (4) the number of respondents who complete the Test Item Number 4 incorrectly is 54 students or 84.37% of the total respondents; and (5) the number of respondents who do not complete the Test Item Number 4 is 4 students or 6.25% of the total respondents.

Then, the second error that most of these students commit has been found in the Test Item Number 3b, which is related to the completion of quadratic equation by using the ABC Formula. The details on the second error might be elaborated as follows: (1) the total number of respondents who complete the Test Item Number 3b is 61 students or 95.31% of the total respondents; (2) the number of respondents who commit errors the Test Item Number 3b is 55 students or 85.93% of the total respondent; (3) the number of respondents who complete the Test Item Number 3b correctly is 9 students or 14.06% of the total respondents; (4) the number of respondents who complete the Test Item Number 3b incorrectly is 52 students or 81.25% of the total respondents; and (5) the number of respondents who do not complete the Test Item Number 3b is 3 students or 4.68% of the total respondents.

Next, the third error that the most of these students commit has been found in the Test Item Number 2b, which is related to the completion of quadratic equation by identifying the identical binomials. The details on the third error might be elaborated as follows: (1) the total number of respondents who complete the Test Item Number 2b is 60 students or 95.75% of the total respondents; (2) the number of respondents who commit errors the Test Item Number 2b is 54 students or 84.37% of the total respondent; (3) the number of respondents who complete the Test Item Number 2b correctly is 6 students or 9.37% of the total respondents; (4) the number of respondents who complete the Test Item Number 2b incorrectly is 54 students or 84.37% of the total respondents; and (5) the number of respondents who do not complete the Test Item Number 2b is 4 students or 6.25% of the total respondents.

Subsequently, the fourth type of error that most of these students commit has been found in the Test Item Number 2a, which is related to the completion quadratic equation by identifying the identical binomials, and also in the Test Item Number 3a, which is related to the completion of quadratic equation by using the ABC Formula. The details on the fourth error for the Test Item Number 2a might be elaborated as follows: (1) the total number of respondents who complete the Test Item Number 2a is 60 students or 93.75% of the total respondents; (2) the number of



respondents who commit errors the Test Item Number 2a is 53 students or 82.81% of the total respondent; (3) the number of respondents who complete the Test Item Number 2a correctly is 11 students or 17.18% of the total respondents; (4) the number of respondents who complete the Test Item Number 2a incorrectly is 49 students or 76.56% of the total respondents; and (5) the number of respondents who do not complete the Test Item Number 2a is 4 students or 6.25% of the total respondents. On the other hand, the details on the fourth error for the Test Item Number 3a might be elaborated as follows: (1) the total number of respondents who complete the Test Item Number 3a is 61 students or 95.31% of the total respondents; (2) the number of respondents who commit errors the Test Item Number 3a is 53 students or 82.81% of the total respondent; (3) the number of respondents who complete the Test Item Number 3a correctly is 11 students or 17.18% of the total respondents; (4) the number of respondents who complete the Test Item Number 3a incorrectly is 50 students or 78.12% of the total respondents; and (5) the number of respondents who do not complete the Test Item Number 3a is 3 students or 4.68% of the total respondents.

Afterward, the fifth error that most of these students commit has been found in the Test Item Number 1c, which is related to the completion of quadratic equation by using factorial procedures. The details on the fifth error might be elaborated as follows: (1) the total number of respondents who complete the Test Item Number 1c is 64 students or 100.00% of the total respondents; (2) the number of respondents who commit errors the Test Item Number 1c is 52 students or 81.25% of the total respondent; (3) the number of respondents who complete the Test Item Number 1c correctly is 12 students or 18.75% of the total respondents; and (4) the number of respondents who complete the Test Item Number 1c incorrectly is 52 students or 81.25% of the total respondents.

Furthermore, the sixth error that most of these students commit has been found in the Test Item Number 1b, which is related to the completion of quadratic equation by using factorial procedures. The details on the sixth error might be elaborated as follows: (1) the total number of respondents who complete the Test Item Number 1b is 64 students or 100.00% of the total respondents; (2) the number of respondents who complete the Test Item Number 1b correctly is 13 students or 20.31% of the total respondents; (3) the number of respondents who complete the Test Item Number 1b incorrectly is 51 students or 79.68% of the total respondents; and (4) the number of respondents who do not complete the Test Item Number 1c is 0 students or 0.00% of the total respondents.

Last but not the least, the seventh error that most of these students commit has been found in the Test Item Number 1a, which is related to the completion of quadratic equation by using the factorial procedures. The details on the seventh error might be elaborated as follows: (1) the total number of respondents who complete the Test Item Number 1a is 49 students or 76.56% of the total respondents; (2) the number of respondents who complete the Test Item Number 1a correctly is 15 students or 23.43% of the total respondents; and (3) the number of respondents who complete the Test Item Number 1a incorrectly is 49 students or 76.56% of the total respondents.

The students' difficulties in learning Quadratic Equation materials might be viewed from their errors when they are completing the test items of Quadratic Equation. According to Haylock & Thangata (2007, p.65), it is possible that the students commit error in completing their mathematical written assignment, practical assignment and ora response with regards to the questions provided by the teachers. In addition, the errors might also be resulted from the procedural abandonment. Thus, these errors might uncover the incapability to understand the mathematical concepts, principles and procedures. Not to mention, the errors that have been committed in completing the materials of Quadratic Equation has been caused by the fact the students have less understanding toward the concept of Quadratic Equation and its manner of solution, the student have less counting skills and also the students have incapability to link the concepts of Quadratic Equation to the other concepts of Mathematics. With regards to the context of the study, the concept-related errors that have been found are related to the concepts in completing the quadratic equation. Specifically, the concept-related errors that have been found are the concept-related errors in completing the quadratic equation by performing the



factorial procedures, through the identification of identical binomials, and by using the formula. These concept-related errors, or the miscomputation/miscalculation, take place due to: (1) the errors in defining the counting operation that should be performed; (2) the errors in adding, subtracting, dividing and multiplying both segments with the same number; and (3) the fundamental errors in counting skills namely addition, subtraction, multiplication and division. These errors assert again the information from the essay-type test item that has been related to the Quadratic Equation and emphasize that the students have been less able to scrutinize the sentences within the essay-type test item and also less able to link the sentences to the necessary concepts, in this case the concept of rectangular area and the concept of quadratic equation.

**Table 2.** Students' Obstacles in Learning the Materials of Quadratic Equation (N = 64)

No.	Factor / Source	Number of Items	Number of Items		Percentage
			Data Inputted	Obstacles Attained	
A	Teacher				
	Personality	2	74	31	24,21%
	Material Mastery	3	111	34	17,70%
	Material Delivery	4	148	7	30,07%
	Classroom Management	2	74	6	4,68%
	Students' Motivation	2	74	33	25,78%
B	Students				
	Capacity	5	185	148	46,25%
	Interest and Attitude	7	59	131	29,24%
	Preparedness	2	74	40	20,83%
C	Facilities				
	Textbooks	3	185	40	20,83%
	Library	2	74	21	16,40%
	Classroom	2	74	82	64,06%

From the factor of teacher, the obstacles that the students have in learning the materials of Quadratic Equation are related to material delivery (30.07%), students' motivation (25.78%), personality (24.21%), material mastery (23.43%) and classroom management (4.68%). Then, from the factor of student, the obstacles that the students have in learning the materials of Quadratic Equation are related to the students' capacity in retrieving the materials of Quadratic Equation (46.25%), the students' attitude and interest toward the materials of Quadratic Equation (29.24%) and the students' readiness in retrieving the materials of Quadratic Equation (20.83%). Last but not the least, from the factor of facilities, the obstacles that the students have in learning the materials of Quadratic Equation are related to the classroom (64.06%), textbooks (33.12%) and library (16.40%).

#### **Description on the Obstacles of Grade IX Students of Angkasa Adisucipto Junior High School from the Factors of Teacher, Student and Facilities**

Based on the results of the questionnaire on the students' obstacles from the factors of teacher, student and facilities, several findings have been gathered. From the factors of teacher, the students' obstacles with regards to the material delivery might be described as follows: (1) 29 students (45.31% respondents) state that the teacher has been too fast in delivering the materials of Quadratic Equation; (2) 25 students (39.06% respondents) state that the teacher has not delivered the materials of Quadratic Equation in such a way that the students will be interested; (3) 13 students (20.31% respondents) state that the teacher has not provided any homework with regards to the materials of Quadratic Equation; and (4) 10 students (15.62% respondents) state that the teacher has not provided any example from the daily life in explaining the materials of Quadratic Equation. Then, the students' obstacles with regards to the motivation might be described as follows: (1) 21 students (32.18% respondents) state that the teacher has never provided any feedback (score) to every assignment that has been submitted; and (2) 14 students (18.75% respondents) state that the teacher has never tried to motivate the students in learning the materials of Quadratic Equation. Next, the students' obstacles with

regards to the teacher's personality might be described as follows: (1) 16 students (25.00% respondents) state that the teacher has not come on time to teach them; and (2) 15 students (23.43% respondents) state that the teacher has been difficult to communicate with. Furthermore, the students' obstacles with regards to the teacher's mastery of materials might be described as follows: (1) 12 students (18.75% respondents) state that the teacher has not clearly explained the materials of Quadratic Equation; (2) 5 students (13.00% respondents) state that the teachers has not explained fluently the materials of Quadratic Equation; and (3) 9 students (14.06% respondents) state that the teacher has not answered clearly and satisfactorily the questions that the students have raised with regards to the learning materials of Quadratic Equation. Last but not the least, the students' obstacles with regards to the teacher's classroom management might be described as follows: (1) 4 students (6.25% respondents) state that the teacher has not provided the students with any question when he is explaining the materials of Quadratic Equation; and (2) 2 students (3.12% respondents) state that the teacher has not provided the students with any opportunity to raise questions when he has completed delivering the materials of Quadratic Equation.

From the factors of the student, the students' obstacles in learning the materials of Quadratic Equation have been various namely: (1) the students' capacity in retrieving the materials of Quadratic Equation (46.25%); (2) the students' attitude and interest toward the materials of Quadratic Equation (29.24%); and (3) the students' preparedness in retrieving the materials of Quadratic Equation. These obstacles might be elaborated further into several details. First of all, the students' obstacles with regards to their capacity in retrieving the materials of Quadratic Equation might be described as follows: (1) 42 students (65.62% respondents) state that they have difficulties in learning the materials of Quadratic Equation; (2) 39 students (60.09% respondents) state that they have been unable to mention several applications of Quadratic Equation in the context of their daily life; (3) 39 students (60.09% respondents) state that the materials of Quadratic Equation have been difficult; (4) 18 students (28.12% respondents) state that they have never tried to complete any test item of Quadratic Equation; and (5) 10 students (15.62%) state that they have never tried to do any exercise on the materials of Quadratic Equation. (1) 35 students (54.68% respondents) state that learning the materials of Quadratic Equation has been boring; (2) 23 students (35.93%) students state that they have not understood the point of learning the materials of Quadratic Equation; and (3) 20 students (31.20% respondents) state that they have not enjoyed learning the materials of Quadratic Equation; (4) 15 students (23.43% respondents) state that they have not been enthusiastic in learning the materials of Quadratic Equation; (5) 13 students (20.31% respondents) state that they have not been interested in learning the materials of Quadratic Equation; and (6) 8 students (12.50% respondents) state that they have never asked either their peers or their teacher whenever they have difficulties in learning the materials of Quadratic Equation. Last but not the least, the students' obstacles with regards to their preparedness in retrieving the materials of Quadratic Equation might be described as follows: (1) 31 students (48.43% respondents) state that they have not learned the materials of Quadratic Equation before the materials are taught by the teacher in the classroom; and (2) 24 students (37.50% respondents) state that they have never learned again the materials of Quadratic Equation that the teacher has delivered in the classroom.

Eventually, from the factors of facilities, the students' obstacles in learning the materials of Quadratic Equation have also been various namely: (1) classroom (64.06%); (2) textbooks (33.12%); and library (16.40%). Similarly, these obstacles might be elaborated further into several details. First, the students' obstacles with regards to the classroom might be described as follows: (1) 52 students (81.25% respondents) state that the classroom has always been so noisy that it becomes difficult for them to study; and (2) 30 students (46.87% respondents) state that the classroom condition has been inconvenient for them to study. Second, the students' obstacles with regards to the textbooks might be described as follows: (1) 41 students (64.06% respondents) state that Mathematics textbooks have always provided minimum examples of Quadratic Equation; (2) 25 students (39.06%) state that the Mathematics textbooks have been difficult to learn and to understand; (3) 22 students (39.06% respondents) state that

the Mathematics textbooks that they should afford have been expensive; (4) 11 students (17.18% respondents) state that they have only had one Mathematics textbook; and (5) 7 students (10.93% respondents) state that they have not had any Mathematics textbook (both by means of personal possession and by means of borrowing). Third, or the last one, the students' obstacles with regards to the library might be described as follows: (1) 2 students (3.12% respondents) state that the library in their junior high school has not provided any Mathematics textbook; and (2) 19 students (29.26% respondents) state that the procedures of borrowing the textbooks from the library have been difficult.

### **The Students' Obstacles in Learning the Materials of Quadratic Equation**

The indicators of learning achievement, or principally the discovery of ideal learning results, include all of the changing psychological domains as the consequence of the students' teaching and learning process (Syah, 2002, p.150). Then, the factors that influence the students' learning might be classified into three categories namely: (1) internal factors, which refers to the students' physical and psychological (spiritual) conditions; (2) external factors, which refers to the conditions around the students' neighbourhood; and (3) approach to learning factors (Syah, 2002, p.132). Specific to the context of mathematical learning process, the factors that might pose certain influence consist of: (1) students; (2) teachers; (3) facilities; and (4) assessment. The factors of students include: (1) capacity and preparedness; (2) interest and attitude; (3) intelligence; and (4) physiological and psychological condition. Then, the factors of teachers include: (1) teaching capacity; (2) material mastery; (3) personality; (4) experience; and (5) motivation in teaching Mathematics. Next, the factors of facilities include: (1) teaching aid; (2) textbooks; (3) laboratory; and (4) classroom situation. Last but not the least, the factors of assessment only consist of the assessment methods that will be implemented by the teacher. With regards to these obstacles, within the conduct of the study the description on the students' obstacles in learning the materials of Quadratic Equation has been gathered.

The data from Table 2 show the students' obstacles in learning the materials of Quadratic Equation from the factors of teachers namely: (1) material delivery (30.07%); (2) students' motivation (25.78%); (3) personality (24.21%); (4) material mastery (23.43%); and (5) classroom management (4.68%). In relation to these aspects, based on the results of the questionnaire on the students' obstacles in completing the materials of Quadratic Equation the obstacles that have been related to the material delivery might be described as follows: (1) 29 students (45.31% respondents) state that the teacher has been too fast in delivering the materials of Quadratic Equation; (2) 25 students (39.06% respondents) state that the teacher has not delivered the materials of Quadratic Equation in such a way that the students will be interested; (3) 13 students (20.31% respondents) state that the teacher has not provided any homework with regards to the materials of Quadratic Equation; and (4) 10 students (15.62% respondents) state that the teacher has not provided any example from the daily life in explaining the materials of Quadratic Equation. Then, the obstacles that have been related to the students' motivation might be described as follows: (1) 21 students (32.18% respondents) state that the teacher has never provided any feedback (score) to every assignment that has been submitted; and (2) 14 students (18.75% respondents) state that the teacher has never tried to motivate the students in learning the materials of Quadratic Equation. Next, the obstacles that have been related to the personality might be described as follows: (1) 16 students (25.00% respondents) state that the teacher has not come on time to teach them; and (2) 15 students (23.43% respondents) state that the teacher has been difficult to communicate with. Furthermore, the obstacles that have been related to the material mastery might be described as follows: (1) 12 students (18.75% respondents) state that the teacher has not clearly explained the materials of Quadratic Equation; (2) 5 students (13.00% respondents) state that the teachers has not explained fluently the materials of Quadratic Equation; and (3) 9 students (14.06% respondents) state that the teacher has not answered clearly and satisfactorily the questions that the students have raised with regards to the learning materials of Quadratic Equation. Last but not the least, the obstacles that have been related to the classroom management might be described as follows: (1) 4 students (6.25% respondents) state that the teacher has not provided the

students with any question when he is explaining the materials of Quadratic Equation; and (2) 2 students (3.12% respondents) state that the teacher has not provided the students with any opportunity to raise questions when he has completed delivering the materials of Quadratic Equation.

In addition to the students' obstacles in learning the materials of Quadratic Equation from the factors of teachers, the data in Table 2 also show the students' obstacles in learning the materials of Quadratic Equation from the factors of students namely: (1) the students' capacity in retrieving the materials of Quadratic Equation (46.25%); (2) the students' interest and attitude toward the materials of Quadratic Equation (29.24%); and (3) the students' preparedness in retrieving the materials of Quadratic Equation. In relation to these findings, the results of the questionnaire on the students' obstacles in learning the materials of Quadratic Equation from the factors of students the obstacles that have been related to the students' capacity in retrieving the materials of Quadratic Equation are as follows might be described as follows: (1) 42 students (65.62% respondents) state that they have difficulties in learning the materials of Quadratic Equation; (2) 39 students (60.09% respondents) state that they have been unable to mention several applications of Quadratic Equation in the context of their daily life; (3) 39 students (60.09% respondents) state that the materials of Quadratic Equation have been difficult; (4) 18 students (28.12% respondents) state that they have never tried to complete any test item of Quadratic Equation; and (5) 10 students (15.62%) state that they have never tried to do any exercise on the materials of Quadratic Equation. Then, the obstacles that have been related to the students' attitude and interest toward the materials of Quadratic Equation might be described as follows: (1) 35 students (54.68% respondents) state that learning the materials of Quadratic Equation has been boring; (2) 23 students (35.93%) students state that they have not understood the point of learning the materials of Quadratic Equation; and (3) 20 students (31.20% respondents) state that they have not enjoyed learning the materials of Quadratic Equation; (4) 15 students (23.43% respondents) state that they have not been enthusiastic in learning the materials of Quadratic Equation; (5) 13 students (20.31% respondents) state that they have not been interested in learning the materials of Quadratic Equation; and (6) 8 students (12.50% respondents) state that they have never asked either their peers or their teacher whenever they have difficulties in learning the materials of Quadratic Equation. Last but not the least, the obstacles that have been related to the students' preparedness in retrieving the materials of Quadratic Equation might be described as follows: (1) 31 students (48.43% respondents) state that they have not learned the materials of Quadratic Equation before the materials are taught by the teacher in the classroom; and (2) 24 students (37.50% respondents) state that they have never learned again the materials of Quadratic Equation that the teacher has delivered in the classroom.

Eventually, the data in Table 2 also uncover the students' obstacles in learning the materials of Quadratic Equation from the factors of facilities namely: (1) classroom (64.06%); (2) textbooks (33.12%); and library (16.40%). With regards to these findings, the results of the questionnaire on the students' obstacles in learning the materials of Quadratic Equation provide several implications. First, the obstacles that have been related to the classroom might be described as follows: (1) 52 students (81.25% respondents) state that the classroom has always been so noisy that it becomes difficult for them to study; and (2) 30 students (46.87% respondents) state that the classroom condition has been inconvenient for them to study. Second, the obstacles that have been related to the textbooks might be described as follows: (1) 41 students (64.06% respondents) state that Mathematics textbooks have always provided minimum examples of Quadratic Equation; (2) 25 students (39.06%) state that the Mathematics textbooks have been difficult to learn and to understand; (3) 22 students (39.06% respondents) state that the Mathematics textbooks that they should afford have been expensive; (4) 11 students (17.18% respondents) state that they have only had one Mathematics textbook; and (5) 7 students (10.93% respondents) state that they have not had any Mathematics textbook (both by means of personal possession and by means of borrowing). Third, or the last one, the obstacles that have been related to the library might be described as follows: (1) 2 students (3.12% respondents) state that the library in their junior high school has not provided any

Mathematics textbook; and (2) 19 students (29.26% respondents) state that the procedures of borrowing the textbooks from the library have been difficult.

In sum, the five top obstacles in learning the materials of Quadratic Equation are as follows: (1) classroom (64.06%); (2) students' capacity (46.25%); (3) material delivery (30.07%); (4) students' interest and attitude toward the materials of Quadratic Equation; and (5) students' motivation (25.78%). These data imply that classroom has been the first top obstacle that the students deal with for most of the time. The obstacles that have been related to the classroom consist of classroom condition and classroom situation. The results of the questionnaire on the students' obstacles in learning the materials of Quadratic Equation with regards to the classroom are as follows: (1) 52 students (81.25% respondents) state that the classroom has always been so noisy that it becomes difficult for them to study; and (2) 30 students (46.87% respondents) state that the classroom condition has been inconvenient for them to study. Conducive situation within the learning environment is very helpful for the learning development of the students; consequently, there should be convenient and supportive condition in the learning environment so that the teaching-learning process of the students might be well-supported. On the contrary, if the classroom is noisy and inconvenient for learning then the students' learning process will be inhibited.

Then, the second top obstacle that the students deal with for most of the time is the students' capacity. The obstacles that have been related to the students' capacity consist of the capacity in learning the materials of Quadratic Equation, the capacity in completing the test items of Quadratic Equation and the capacity in completing the homework of Quadratic Equation. The results of the questionnaire on the students' obstacles in learning the materials of Quadratic Equation with regards to the students' capacity are as follow: (1) 42 students (65.62% respondents) state that they have difficulties in learning the materials of Quadratic Equation; (2) 39 students (60.09% respondents) state that they have been unable to mention several applications of Quadratic Equation in the context of their daily life; (3) 39 students (60.09% respondents) state that the materials of Quadratic Equation have been difficult; (4) 18 students (28.12% respondents) state that they have never tried to complete any test item of Quadratic Equation; and (5) 10 students (15.62%) state that they have never tried to do any exercise on the materials of Quadratic Equation. These findings certainly assert that the students have been suffering from the difficulties in learning the materials of Quadratic Equation. Indeed, Quadratic Equation has been one of the materials in Mathematics that demand numerous concept understandings and counting skills. Therefore, in order to improve the students' capacity, the students should perform more exercises and should ask the teachers whenever they have difficulties within the exercises.

Next, the third top obstacle that the students deal with for most of the time is material delivery by the teacher. The obstacles that have been related to the material delivery by the teacher consist of the teacher's attractiveness in delivering the materials, the teacher's speed in delivering the materials and the teacher's explanation about the examples of Quadratic Equation in the daily life. The results of the questionnaire on the students' obstacles in learning the materials of Quadratic Equation with regards to the material delivery are as follow: 1) 29 students (45.31% respondents) state that the teacher has been too fast in delivering the materials of Quadratic Equation; (2) 25 students (39.06% respondents) state that the teacher has not delivered the materials of Quadratic Equation in such a way that the students will be interested; (3) 13 students (20.31% respondents) state that the teacher has not provided any homework with regards to the materials of Quadratic Equation; and (4) 10 students (15.62% respondents) state that the teacher has not provided any example from the daily life in explaining the materials of Quadratic Equation. Departing from these obstacles, it might be inferred that there should be linkage between the materials of Quadratic Equation and the context of daily life by means of examples on the Quadratic Equation in the real life. In the same time, the teacher's attractiveness in delivering the materials highly influence the students' learning achievement. Therefore, it is expected that the teachers should be able to deliver the materials well and attractively. With regards to material delivery, the material delivery that has been intended in the study covers the aspects of material mastery, speaking manner and

classroom management. Specific to the speaking manner, it should be asserted that the teacher has to deliver the materials under more manageable pace.

The fourth top obstacle that the students deal with for most of the time is students' interest and attitude toward the learning materials of Quadratic Equation. The obstacles that have been related to the students' interest and attitude toward the learning materials of Quadratic Equation consist of the knowledge on the benefits from learning materials of Quadratic Equation, the interest in learning the materials of Quadratic Equation, the sense of curiosity in learning the materials of Quadratic Equation, the joy in learning the materials of Quadratic Equation, the attraction in learning the materials of Quadratic Equation and the enthusiasm in learning the materials of Quadratic Equation. The results of the questionnaire on the students' obstacles in learning the materials of Quadratic Equation with regards to the students' interest and attitude toward the learning materials of Quadratic Equation are as follow: (1) 35 students (54.68% respondents) state that learning the materials of Quadratic Equation has been boring; (2) 23 students (35.93%) students state that they have not understood the point of learning the materials of Quadratic Equation; and (3) 20 students (31.20% respondents) state that they have not enjoyed learning the materials of Quadratic Equation; (4) 15 students (23.43% respondents) state that they have not been enthusiastic in learning the materials of Quadratic Equation; (5) 13 students (20.31% respondents) state that they have not been interested in learning the materials of Quadratic Equation; and (6) 8 students (12.50% respondents) state that they have never asked either their peers or their teacher whenever they have difficulties in learning the materials of Quadratic Equation. The students' interest, attitude and even seriousness in learning the materials of Quadratic Equation will influence the learning success of the students themselves. Therefore, the awareness and the willingness to learn Mathematics should be internalized among the students.

The fifth top obstacle, or the last one, that the students deal with for most of the time is the students' motivation. In this regard, obstacle behind the students' motivation is related to how the teachers motivate the students to learn the materials of Quadratic Equation. The results of the questionnaire on the students' obstacles in learning the materials of Quadratic Equation with regards to the students' students' motivations are as follow: (1) 21 students (32.18% respondents) state that the teacher has never provided any feedback (score) to every assignment that has been submitted; and (2) 14 students (18.75% respondents) state that the teacher has never tried to motivate the students in learning the materials of Quadratic Equation. Departing from these findings, it might be inferred that the teacher should provide feedback (score) for every single assignment that has been given to the students. In addition, it might also be inferred that the teacher should motivate the students because once the students have been motivated the teaching-learning process will proceed fluently without any significant obstacle. Thus, in turn the learning results will be better.

## CONCLUSIONS

Departing from the results of and the discussions within the study, there are several conclusions that might be drawn. First of all, there are seven top ttypes of errors that the Grade IX students of Angkasa Adisucipto Junior High School have committed namely: (1) the errors in completing the essay-type test items that have been related to the materials of Quadratic Equation (58 students or 90.62% respondents); (2) the errors in completing the materials of Quadratic Equation by using the ABC Formula (55 students or 85.93% respondents); (3) the errors in completing the materials of Quadratic Equation by completing the binomials (54 students or 84.37% respondents); (4) the errors in completing the materials of Quadratic Equation by both identifying the identical binomials and by using the ABC Formula (53 students or 82.81% respondents); (5) the errors in completing the materials of Quadratic Equation by performing the factorial procedures (52 students or 81.25% respondents); (6) the errors in completing the materials of Quadratic Equation by performing the factorial procedures (51 students or 79.68% respondents); and (7) the errors in completing the materials of Quadratic Equation by performing the factorial procedures (49 students or 76.56% respondents).

Then, the size of the obstacles that the Grade IX students of Angkasa Adisucipto Junior High School have has been related to three factors namely teacher, students and facilities. From the factor of the teachers, the size of the obstacles might be described as follows: (1) material delivery (30.07%); (2) students' motivation (25.78%); (3) personality (24.21%); (4) material mastery (23.43%); and (5) classroom management (4.68%). Then, from the factors of students the size of the obstacle might be described as follows: (1) the students' capacity in retrieving the materials of Quadratic Equation (46.25%); (2) the students' interest and attitude toward the materials of Quadratic Equation (29.24%); and (3) the students' preparedness in retrieving the materials of Quadratic Equation (20.83%). Last but not the least, from the factors of facilities the size of the obstacle might be described as follows: (1) classroom (64.06%); (2) textbooks (33.12%); and (3) library (16.40%).

Furthermore, the errors that the Grade IX students of Angkasa Adisucipto Junior High School have been committed are related to the concept understanding and the counting skills. The errors that these students have committed in relation to the concept understanding are as follows: (1) the students do not formulate the mathematical concept by means of appropriate symbol and language; (2) the students commit errors in using the formula or theorem, such as the ABC Formula, in completing the test item of Quadratic Equation; (3) the students do not use any formula or theorem for completing the test items of Quadratic Equation; (4) the students do not formulate the mathematical concept by using the appropriate symbol or language; and (5) the students do not use the appropriate formula or, specifically, the students do not at both segments with  $\left(\frac{b}{2a}\right)^2$  in identifying the identical binomials. On the other hand, the errors that these students have committed in relation to the counting skills are as follows: (1) the students suffer from miscalculation in adding or subtracting both segments by the same number in defining the final results; (2) the students suffer from miscalculation in defining the counting operation that should be used; and (3) the students suffer from miscalculation in elaborating the test items of Quadratic Equation.

Last but not the least, the obstacles that the Grade IX students of Angkasa Adisucipto Junior High School might be described as follows: (1) the teacher is not attractive and too fast in delivering the materials of Quadratic Equation; (2) the students are less prepared and display lower level of interest and attitude toward the learning materials of Quadratic Equation; and (3) the classroom is still too noisy and inconvenient for the students to learn the materials of Quadratic Equation.

By identifying the errors that the students have committed in completing the materials of Quadratic Equation, it is suggested that the teachers should not too fast in delivering the materials. In addition, it is also suggest that the teachers should emphasize the parts in which the students have mostly committed errors so that these errors might be minimized in the future since the materials of Quadratic Equation are parts of Algebra and have been the basis for learning the materials of Quadratic Equation in the higher degree namely Senior High School and University. By doing so, it is expected that the students might learn the materials of Quadratic Equation in a better way.

As concluding remarks, the types of errors that the students commit in completing the test items of Quadratic Equation might serve as a matter of consideration in the future. With the findings on these errors, there might be preventive efforts for the students so that the students might understand the existing mathematical concepts within Quadratic Equation well. Then, in order to minimize the computation errors, the counting skills of the students should be improved by, for example, performing more exercises so that the students might be more skilled in performing their counting skills. Eventually, by identifying the errors that the students' errors in learning the materials of Quadratic Equation preventive measures might be taken in order to minimize the errors. The preventive measures that might be taken are, for example, giving explanation or understanding on the importance of learning Mathematics in the daily life. In the same time, there should be continuous improvement recalling the fact that the materials of Quadratic Equation in the Junior High School should be understood well prior to entering the higher educational degree namely Senior High School. If the students less master the materials



of Quadratic Equation in the Senior High School then they will certainly suffer from difficulties in learning the similar materials as they continue to the Senior High School.

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