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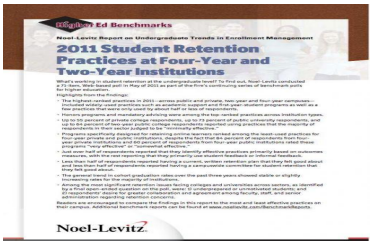

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ARTICLES

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THE STUDENTS' DIFFICULTIES IN COMPLETING GEOMETRY ITEMS OF NATIONAL EXAMINATION

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Abstract
The study aims to describe the students' difficulties in completing the geometry test items of national examinations. The study was case study case using qualitative approach. The data were gathered utilizing the documentation of students' responses toward the mathematics items of junior high school national examination and focus group discussion that involved 15 mathematics teachers from 12 provinces in Indonesia. The data were analyzed by performing the Cresswell steps. The results of the study showed that the students' difficulties in completing geometry test items were the students' lack of geometry concept mastery, the students' problems in associating geometrical concept to others, the students' problems in solving problems by means of computation technique and the students' limitations in performing mathematical visualization and representation.

Keywords: Students' difficulties, geometry test item, national examination.

INTRODUCTION

Mathematics has been knowledge that people use in their daily life. In fact, mathematics have also been deployed in other sciences such as natural science, economics and other alike. Mathematics has formally been studied since the fundamental level. On the other hand, mathematics has informally been studied since the very early level of one's life. According to Ganal and Guiab (2014), mathematics has been a manner of thinking, of arranging logical evidence and of communicating through a teaching-learning process. In line with the statement, Satriawan and Wutsqa (2013) state that mathematics has been a lesson of paradigm, pattern, relationship, arrangement and worldview. Mathematics itself had a very wide coverage. Therefore, Mathematics has several branches that might be studied. One of the branches that mathematics has is geometry.

Geometry is one of the branches in mathematics that has been important and been heavily associated to the daily life. Geometry itself has been related to the other branches in mathematics or the other field outside mathematics. According to Biber, et al. (2013), geometry bridges daily events and mathematical concepts so that geometry has very important role in studying mathematics. This statement is in line with statement from Zuya and Kwalat (2015, p.101), "Problems that are related to the other branches of mathematics can be solved using the knowledge of geometry, apart from its usage for solving daily life problems," and Hwang et al. (2009, p.229), "Geometry is one of fundamental methods which people use to understand and to explain the physical environment by

measuring length, surface area and volume". According to Ganal and Guiab (2014), geometry has been an interesting part of mathematics, has multiple approaches and covers interesting problems and surprising theorems. In addition, they also state, "Geometry appeals to our visual, aesthetics and intuitive senses" (Ganal & Guiab, 2014, p.2002).

Geometry learning that has been provided to the students has several objectives. According to Ly and Malone (2009), the objective of conducting mathematic learning, especially the geometry learning, for the students has been to develop an understanding in relation to the concept and the communication of unknown amount and values by means of signs, symbols, models, graphics and mathematical terms. On the contrary, according to Ganal and Guiab (2014) the objective of geometry learning has been to assist the students in developing their visualization skills, critical thinking, intuition, perspective, problem-solving, conjecturing, deductive reasoning, logical arguments and proofing. Although geometry has been one of the branches in mathematics tends to be used only for solving the mathematics-related problems Biber et al. (2013) state that geometry might not only be used for solving the mathematical problems in the daily life but also for solving the problems in the daily life that has been related to the other field such as art.

Geometry learning that has several objectives in the daily life shows that geometry has been an important branch in mathematics. Geometry has been included into the mathematics learning curriculum in each educational degree; as a result, it is also included into the guidelines of National Examination. According to BSNP (2015), national examination is an activity of measuring graduates' competency in certain lessons nationally and by referring to the standards of graduates' competency. Mathematics national examination, especially the one that includes geometry, has been found in each educational degree specifically in junior high schools. Mathematics national examination, specifically geometry, is adjusted to the national examination guidelines that have been previously published by the government. The objective is to prepare the students and to master geometry materials more. However, the reality speaks another matter. Based on the data from BSNP (2016), the results of 2015/2016 National Examination shows that the ability of absorbing mathematics national examination test item for geometry and measurement in the Province of Yogyakarta Special Region in Indonesia has been 52.42% in the provincial level and such percentage has been the lowest one in comparison to the other mathematical material learning mastery such as numbers (58.21%), algebra (56.64%) and statistics (55.99%). Meanwhile, the results of mathematics national examination for the geometry and measurement materials in the national level has been 47.19% and has earned the third position after the other materials such as algebra (52.97%) and numbers (52.74%); below geometry, there has been statistics (46.73%). Based on the data from the results of mathematics national examination absorbing ability, it is apparent that the absorbing ability or the understanding of junior high school students in geometry has still relatively been low.

The mastery of geometry materials for the junior high school students that has still been relatively low might be caused by several factors and these factors might come from learning process, students' internal aspect and teachers' internal aspect. According to Tambychik, Subahan and Meerah (2010), most of the students have been week in the following mathematical skills: visual-spatial, information, shape orientation, inter-problems relationship establishing, memorizing ability and interrelated facts memorization. More specifically, students have difficulties in learning geometry materials because of several matters. According to Kikovich (2015), the difficulties that students experience in geometry are the ones related to understanding mathematical language in geometry and associating it to the preliminary knowledge that they have. In addition, based on the study by Ozerem (2012), he found that the 7^{th} grade students have difficulties in geometry and these difficulties are problems of misunderstanding, students' weak memorization toward geometrical formula or concept that has been used, students' incapability of establishing positive attitude toward geometry and students' incapability to associate geometry to the real life. Other causes of students' difficulties in learning geometry have also been provided by Gloria (2015). According to her study, these causes have been the weak concept mastery, the weak understanding toward mathematical skills, and the lack of

students' enthusiasm toward the studied branch; altogether, these causes might trigger difficulties and negative response toward the lesson.

Although geometry is one of the branches in mathematics, the students' difficulties in learning geometrics have not solely been caused by the mathematical factors, the mathematics-related concept or even the geometry itself. Another aspect that might be the cause of students' difficulties in learning geometry is language. Though mathematics and language seem to be two different things, language can be the factor that causes students' difficulties in learning mathematics especially if the learning process does not make use of appropriate language. According to Boulet (2007, p.10), language plays a key role in the mathematics classroom. Most of the time, in the teaching-learning process when a teacher explains the procedures or steps in solving a mathematical problem, especially in solving a geometrical problem, the teacher urges that the students should follow the procedures that have been explained without explaining clearly what they should do with the mathematical numbers, pictures or symbols that have been used. Such learning process will cause the students to follow the procedures that the teacher has explained without understanding what they actually should do in order to solve the problems. According to Boulet (2007), the language that teachers frequently use has confused the students for most of the time and their confusion usually lies in the arithmetical multiplication, geometrical shape or building and measurement.

The junior high school students' difficulties in geometry materials might be anticipated and be overcome with multiple manners. However, overcoming difficulties in learning geometry should also be adjusted to the causes of the students' difficulties themselves. According to Tambychik et al. (2010), before a teacher creates a meaningful learning for the students' intellectual needs, the teacher should understand first the difficulties that the students experience. In order to overcome the students' difficulties in learning geometry, in addition to adjusting the learning process to the students' needs, the teacher should improve himself or herself and the competences that he or she has possessed. According to Patkin (2015), teachers should understand and master multiple ways to teach the concepts of geometry, to devise multiple strategies in teaching those concepts and to integrate activities based on the examples. Kivkovich (2015) suggests that in assisting the students who have learning difficulties teachers might combine media and learning strategies. According to Aydogdu and Kesan (2014), several strategies that have been frequently implemented in order to overcome the students' difficulties in learning geometry materials are drawing pictures, smart guessing and testing, problem simplification, using unidentified information and brainstorming.

In addition, the students' difficulties in geometry might not only be overcome classically in the intra-classroom learning process but might also be overcome by benefitting the technological advance. Multiple computer applications or other forms of technological advance might be used in order to improve the students' understanding toward geometry concepts. Praveen & Leong (2013, p.1) stated, "Educationists see the urgent need for integrating technology in students' mathematical activities". Technology is necessary in mathematical learning especially in the case of geometry. The statetement was in line with the argument of Dimakos and Zarani, (2010, p.113), "The use of technology is needed for students to make significant progress in geometry". One of the forms in technological usage is the use of computer application that supports geometry learning such as the one that provides three-dimensional visual geometrical description, the one that provides understanding toward the concept of line and curve and alike. One of the geometry learning support application that might be accessed and be downloaded easily both by students and teachers is Geogebra. According to Praveen and Leong (2013), Geogebra provides an opportunity for teachers and students to learn the geometry concept altogether by means of exploration and visualization. Based on the results, it is found Geogebra has been an effective tool for supporting geometry learning in the high schools (Bhagat & Chang, 2015; Praveen & Long, 2013). In addition to the operation of certain application or program that has specifically been designed to assist the geometry learning process, such as Geogebra, teachers might also benefit the sophistication of other technology like web-based learning. According to Chan, Tsai and Huang (2006), the technological advance, especially the Internet, might turn geometry into a more effective and comfortable lesson because the web-based learning might

assist the students in establishing the geometry concepts and the improvement of students' achievements.

Based on the facts and the opinions provided by the experts, the study described the difficulties of students in junior high school in completing geometry test items in the national examination. These difficulties might be caused by several factors. Therefore, the study also describe the factors caused that difficulties and the mathematics teacher strategy to resolve them.

METHODS

The research had been a case study that implemented the mixed methods. The quantitative method was implemented first in order to identify the difficult test items, especially the ones in junior high school geometry, based on the students' responses toward the national examination test items. Then, the qualitative method was implemented in order to identify the factors that cause the students' difficulties in completing those geometry test items.

The primary data were 5 geometry test items from the mathematics national examination set altogether with responses provided by 46,313 junior high school students in the Province of Yogyakarta Special Region, Indonesia. The examination sets altogether with the test participants' responses were gathered by means of documentation. Then, the secondary data were gathered from the focus group discussions (FGD) that involved 15 junior high school mathematics teachers from 12 provinces in Indonesia and 4 mathematics expert. The data from the students' responses toward the geometry test items were analyzed by means of classical test theory in order to identify the level of test item difficulty and these data then would be made as the materials of FGD among the junior high school mathematics teachers who would be involved. The objective of the FGD then would be to identify the reason why these test items became difficult.

During the FGD sessions, the teachers were asked to complete the geometry test items first. Then, the teachers discussed why these test items had been difficult for the students and had agreement on the causes of those difficulties. After having found the causes, the teachers were asked to share their experience in relation to the strategies that might be implemented in order to eliminate the difficulties and the strategies that might be appropriate for the students so that the students might overcome their difficulties in completing these geometry test items. The results of FGD then would be analyzed by means of Cresswell steps (2014) that consisted of preparing and compiling data, reading the overall data, coding the data in order to define the theme and to create description, defining the inter-theme relationship and interpreting the theme or description.

FINDINGS

The percentage of the junior high school students who responded geometry test items of the mathematics national examination correctly in the Province of Yogyakarta Special Region would be presented in Table 1.

Table 1: The Percentage of Students Who Responded the Geometry Test Items in the Mathematics National Examination correctly

Test Item Number	Indicator	Percentage of Appropriate Response
25	Solving problems related to triangle congruency	40.80
26	Triangle comparison	47.90
29	Relationship of angles in a circle	44.40
34	Surface width of a pyramid	49.80
35	Combined surface width of geometrical buildings with curving edge	47.30

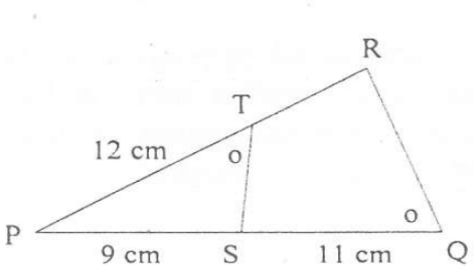
The results of qualitative analysis then would be presented as the materials of FGD in order to identify why these test items had been difficult and the strategies that the students implemented in order to complete these test items. The results of qualitative analysis would be presented in details as follows.

Item 25

Please pay attention to the figure on the right!

The length of TR is … .

A. 2 cm
B. 3 cm
C. 4 cm
D. 6 cm

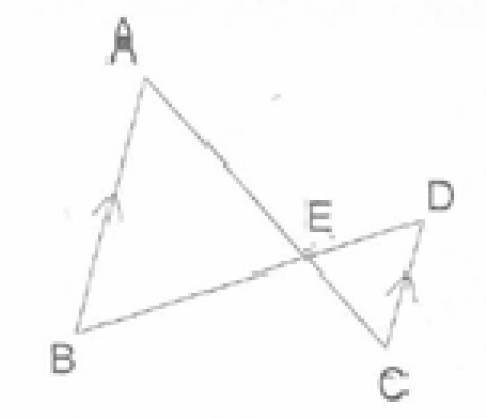


The percentage of the students who responded correctly to the mathematics National Examination test item similar to item 25 above was around 40.80%. The students should master the concept of triangle congruency. In order to complete the test item 25, the students should identify the congruent sides between the PGQ triangle and the PTS triangle so that they could identify the length of TR through $\frac{PQ}{PT} = \frac{PR}{PS}$ in which PR = PT + TR = 12 cm + TR. Thereby, $(\frac{20}{12} = \frac{12+TR}{9})$ so that TR = 3 cm. According to the teachers, the reasons why most of the students did not respond to the test item correctly were their weak ability in identifying the congruent sides. They could not maximize the information of angle congruency in order to determine the congruent sides. In addition, they did not understand the concept of two congruent-side comparison and, as a result, they could not determine the length of TR.

According to the teachers, in order to minimize the students' error in completing the similar test items, there should be an emphasis regarding the congruent sides among the students. The students should be provided with the procedures that might be easily understood in determining the two congruent sides and one of such procedures might be directing the students to focus on the congruent sides. The teachers might also apply operational definitions such as that congruent sides should be flanked by two congruent angles. The teachers' creativity was demanded in presenting their learning materials so that the students would understand the procedure of identifying of congruent sides. The teachers should also emphasize the relationship between two congruent sides so that the students would understand the concept of two congruent-side comparison. Therefore, the possibility to perform errors in selecting the comparing variables might be minimized.

Item 26

Please pay attention to the figure below!



The right comparison is … .

A. $\frac{DE}{AE} = \frac{CD}{AB}$
B. $\frac{CE}{AE} = \frac{CD}{AB}$
C. $\frac{CD}{AB} = \frac{AE}{BE}$
D. $\frac{CD}{AB} = \frac{AE}{DE}$

The percentage of the students who responded correctly to the mathematics National Examination test item similar to the item 26 above was around 47.90%. In order to complete the test item, the students should master the concept of triangle congruency so that they might identify the congruent sides. To identify the congruent sides, the students should understand the relationship the two angles. First, the degree of angle CED and angle BEA was the same because they have against one another. Second, the students should also understand the relationship between the two angles formed by a line (AC or BD) that cut through two parallel lines (AB and CD). The degree of ACD and that of BAC is the same because a pair of alternate interior angles. From the information in the test item, it was found that the congruent sides were the sides that were flanked by the two congruent angles. Thereby, the students might notice that AE had been congruent with CE, BE had been congruent with ED and AB had been congruent with CD and the appropriate comparison should be $\frac{EC}{AE} = \frac{DE}{BE} = \frac{CD}{AB}$. According to the teachers, the reason why most of the students responded to the test item incorrectly was their lack of understanding of the concept of relationship between the two angles formed by a line that cuts two parallel lines; whereas, it is the concept that underlines the determination of the pair of congruent angles. In addition, the students had a weak ability in applying the concept of the relationship the items 26. In general, the students understood only the concept that the test items involve only a simple figure consisting of one line that cuts through two parallel lines. As a result, in dealing with similar test items 26 they will be confused about which concept that they should apply.

Mathematics teachers said that in order to minimize the students' errors when they should complete similar test items, there should be emphasis on the concept of relationship between the angles that are formed from the intersection between a single line and two parallel lines along with its application. The students might be provided with multiple problems of concept implementation with the various visual illustrations. Furthermore, the teachers might also emphasize the concept of congruency. They should ensure that the students might understand the concept by identifying toward the congruent sides.

Item Number 29
In a circle, the size of the angle at the center AOB is 108^O. If the radius of the circle is 7 cm then the length of Arch AB will be … .

A. 132.00 cm
B. 52.80 cm
C. 26.40 cm
D. 13.20 cm

The percentage of the students who responded correctly to the mathematics National Examination test item similar to item 29 was around 44.40%. In order to complete the test items, the students should understand the characteristics of a circle and the concept of angle at the center of a circle. By understanding both the characteristics and the concept, the students would be able to determine that the length of arch AB would be $\frac{180}{360}$ circumference of the 7-cm radius circle. In other words, the length of arch AB would be 13.20 cm. According to the teachers, the reason why most of the students did not respond correctly to the test item was that the students did not understand the concept of angle at the center of a circle. The students did not understand the visualization from the

information that the angle at the center AOB is 108^O and, as a result, they had difficulties in performing the procedures for completing the test items.

In order to minimize the percentage of the students who did not respond to such test items correctly, the teacher suggested that the learning process in the school should emphasize the concept so that the students would have in-depth material understanding. One of the weaknesses that had been identified from the results related to the test item was that the students were too focused on the visual aspect of the test item, in this case the figure. Therefore, the teachers should train the students' visualization ability and representation equally so that they could access any kind of information better.

Item 34
The surface breadth of a pyramid with 12 cm height and 40 cm circumference is … .

A. 360 cm^2
B. 380 cm^2
C. 384 cm^2
D. 396 cm^2

The percentage of the students who responded correctly to the mathematics National Examination test item that similar to item 34 was around 49.48%. The student should understand the concept of pyramid surface breadth such as the involvement of height and base in order to complete the test item. Generally the students were directed to visualize the information into figures in order to ease the test item completion. Thereby, the students would easily identify the other information that would be necessary for determining the pyramid surface breadth. It might be assumed that the pyramid surface breadth consisted of four planes namely one rectangle as the base and four isosceles triangles as the vertical sides. From the initial information, the students found that the circumference of the rectangle were 40 cm and, therefore, the length of rectangular side would be 10 cm and the surface width of the rectangle would be 100 cm^2. In order to determine the surface width of the four isosceles triangles, the students might determine first the height and the base of each triangle. The length of the rectangular side was 10 cm which was equal to the base of the triangle, while the height of the triangle should be determined by applying the Pythagoras theorem so that the students would find that the height of the triangle was 13 cm. As a result, the surface breadth of each triangle (since they were congruent) would be 65 cm^2. From the data, the students might determine that the surface breadth of the pyramid would be (100 + 4 x 65) namely 360cm^2. According to the teachers, there were several reasons why the students made some errors in completing the test item. First, the students considered that the information within the test item mentioning that circumference was equal to 40 cm were unclear. The test item was confusing because the object of the circumference had not been clearly stated. Second, the students had difficulties in concluding that the surface of a pyramid was the combination of one rectangle and four isosceles triangles. The difficulties in concluding the pyramid surface breadth became worse because they were not provided with numbers of illustration of the pyramid. Third, the students also had difficulties in attaining additional information regarding the height of the isosceles triangle using Pythagoras theorem. The students did not understand that the height of an isosceles triangle might be identified by using Pythagoras theorem.

The teachers said that, the mathematics teaching and learning should be emphasis on the concept of geometry and the forming planes among the students within the learning process. The learning process should make use of the contextual model so that the students might perform more in-depth exploration and attain better understanding. The teachers should habituate the students to visualize the test items especially the ones related to geometry. Visualization might ease the students to complete the geometry-related test items. Last but not least, the students might be provided with various geometry exercises so that they might attain many experiences. The students who had

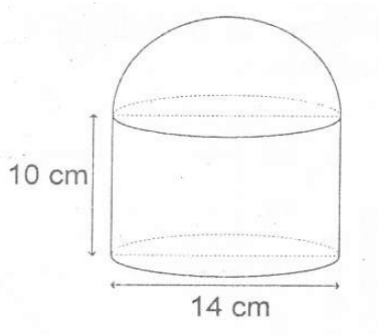
sufficient experiences would not be surprised when they dealt with such test items and they would immediately determine the procedures that they should implement.

Item 35

Please pay attention to the figure of solid matter in the form of cylinder and half of a ball on the right!

The surface breadth of the solid matter is … . ($\pi = \frac{22}{7}$)

A. 702 cm^2
B. 802 cm^2
C. 902 cm^2
D. 1,002 cm^2



The percentage of the students who responded correctly to the mathematics National Examination test item similar to item 35 was around 47.30%. The students should understand that the solid matter, or the geometry, had been covered with the circle, the cylinder layer and the half of a ball in order to complete the test items. The students should scrutinize one plane after another well: the 7 cm-radius circle would imply that the breadth would be 154 cm^2, the cylinder layer with 7-cm radius and 10-cm height would imply that the breadth would be 440 cm^2 and the half of a circle with 7-cm radius would imply that the breadth would be 308 cm^2. Thereby, the surface breadth of the geometry would be combination of the three breadths name (154 + 440 + 308) cm^2 = 902 cm^2. According to the teachers, the low percentage of the students who responded to the test item correctly was the confusion in viewing the combination of two geometries. The root of the problem was that the students had been accustomed to memorizing the geometry formulas so that when there were modified test items they became confused. Most of the students were deceived to calculate the breadth of the ball's base and the cylinder's cover.

Still according to the teachers, in order to minimize the errors there should be emphasis regarding the concept of surface breadth in geometry among the students. In relation to item 35, if the students understood well the concept of surface breadth then they would not be deceived to calculate the breadth of the half of a circle's base or of the cylinder's cover. Similar test items had been considered by the teachers as the relatively complicated ones because the students should combine the understanding of several geometry concepts. Therefore, providing various exercises might be a strategic way to increase the students' understanding.

DISCUSSIONS AND CONCLUSIONS

Based on the results of analysis toward the geometry test items in the mathematics national examination, namely the test item number 25, 26, 29, 34 and 35, there were only 40.80%-49.48% students who had been able to complete these test items appropriately. In other words, there had been more than half of the Indonesian junior high school students who completed geometry test items of the national examination. Based on the results of forum group discussion, the researchers found that there had been several problems that became the students' obstacles in studying geometry; as a result, these obstacles became their difficulties. The causes of the students' difficulties in completing the geometry test items were, namely, the lack of good understanding toward the concepts that would be appropriate to the geometrical or the other mathematical problems or concepts in solving the related problems, the students' weak ability in identifying insight from the test items, the students' weak ability in maximizing the information that they attained from the test items, the students' absence of visualization toward the test items' intention or the test items' insight, the students' weak ability in applying the geometrical concepts toward the similar cases or the cases that

they used to learn, the students' confusion and difficulties in combining one geometrical concept to another and the students' habit of memorizing formulas.

Several difficulties that the students experienced while completing geometry test items were actually related from one to another. Their difficulties started from the fact that the students had not completely mastered both the concepts that had been related to the problems and the concepts that had been related to geometry or the other branches in mathematics. Mathematical concepts had been a fundamental matter that should be understood so that mathematics would not be mere number computations, symbols and formulas. According to Luneta (2015), the knowledge of geometry concepts included the development necessary skills for manipulating the geometrical buildings. When the students understood the concepts in geometry appropriately then they would not be memorizing formulas as having been one of the students' difficulties in completing the national examination test items. The students' habit of memorizing formula would be very helpful for them when they dealt with similar test items or with the test items that they usually completed. However, the habit of memorizing geometry formula, instead of understanding geometry concepts, would cause difficulty for the students when they had to complete rather different geometry test items. The geometry test items that had been considered difficult by the students who often memorized geometry formulas were the ones that had different insights, that had different question, that had additional information, that had deceptive information, or that had different planes or buildings. The students' lack of understanding toward geometry concepts caused the students to have difficulties when they had to deal with similar geometry test items that had different variations; furthermore, the students would have more difficulties when they had to deal with geometry test items that had inter-geometry concepts combination. The abundant concepts in geometry led to a greater possibility that geometry test items might combine several concepts altogether. If the students did not understand the geometry concepts appropriately since the beginning, then the students would have more difficulties when they should deal with the test items that combined several geometry concepts. Oftentimes, it occurred that students had been confused whenever they dealt with the concept combination both in the planes and the geometrical buildings. This problem was apparent when the students should complete the test items that combined the concepts of two planes. The combination of two planes would have different problem-solving methods in comparison to two planes that had separate problem-solving efforts. This aspect should be understood and be scrutinized further by the students.

The students' problem in dealing with the combination of geometry concepts, especially in geometrical building as the one that they found in the national examination test item, might be caused by another factor. This factor was the students' difficulties in visualizing geometry the insight or the question that they had. The students' difficulties in visualizing geometry test items often occurred when they had to complete narrative geometry test items without any picture. In addition, the students' difficulties in visualizing the geometry problems that they encounter also might be caused by several other difficulties. These difficulties were the lack of students' ability in identifying the insights from the test items and the students' incapability to maximize the information that they attained from the test items. If there were information that the students had not identified, then the process of visualizing the intention of the geometry test items would be different. In addition, the students' difficulties in identifying the useful information from the test items might be caused by another problem such as their difficulties in representing the information mathematically. What the students should do, then, in understanding geometry concepts would be to create an analogy among verbal expressions, definition symbols and representation (Magdas, 2015). When the students had identified all information that they found or that had been questioned but the students still had not understood the implemented geometry concepts, then the students would not maximally use the information that they found. What had occurred for most of the time was that the students abandoned most of the information that actually might be applied to completing the geometry test items. Another impact that might appear from such situation was the students' mistakes in representing the test items mathematically, that is in line with Sajadi, Amiripour and Rostamy-

Malkhalifeh (2013, p.8). The mistakes in terms of mathematical representations became the beginning of subsequent mistakes in completing geometry test items of the national examination.

Another students' difficulty in completing geometry test items of the national examination was related to computation. The students who took the national examination would certainly use their time effectively and as maximum as possible. The limited amount of allotted time and the abundant test items that they should complete became a certain challenge for the students in performing the right computation. The students who had been able to understand the concepts appropriately, who had been able to combine several concepts in the problem solving, who had been an expert in finding information from the test items and who had been able to visualize the test items well did not have any guarantee that they would complete the test items appropriately. If the students had errors in their computation then they would attain the wrong final answer. Such situation would result in the scores that had not been different much from the students who had difficulties in terms of concepts and of other matters. Therefore, computation held an important role in mathematics especially geometry. The concept in computation techniques should also be mastered by the students so that the students would be more expert and be more able to use their time effectively in order to complete the national examination test items well. The students who had difficulties in the computation concepts would certainly have obstacles and they would need longer time to complete the national examination test items.

Various difficulties that the students experienced in geometry during the national examination should be evaluated both by the government and by the schools especially the teachers. The active role of government and teachers held would be important in evaluating the students' performance in order to perform better education. One of the roles that the government might play would be issuing better education-related policies and distributing evenly distributing the education throughout Indonesia especially in terms of learning facilities in remote areas. Similarly, one of the roles that the teachers might play would be performing direct interaction with the students who had problems in completing geometry test items of the national examination. Such role might be apparent from the learning process that had been conducted by applying certain learning methods or approaches. The use of learning methods in geometry learning process might be adjusted to the students' condition and ability. "According to the level of geometric thinking of the students, method can vary" (Ozerem, 2012, p.32). The statement implied that there had not been any certain methods that might be implemented for overcoming the students' difficulties in learning geometry throughout Indonesian areas. The statement also implied that teachers should be more familiar with their students and should be more creative in creating and in implementing the learning methods that would be in accordance to their characteristics and difficulties in dealing with geometry test items of the national examination. Similar statement had also been proposed by Zuya and Kwalat (2015) and Okigbo and Okeke, 2011); they stated that teachers should have knowledge regarding their students so that teachers would be able to handle their students' difficulties very effectively. According to Jones (2002), effective geometry learning had been a learning that might ensure that the students had understood the concepts and the steps in the problem-solving proves that might be learned and the learning that might encourage the students to recognize the relationship of different problem solving manners in representing the ideas of geometry of other branches in mathematics. The students' difficulties that were caused by different matters would also demand different learning process in order to overcome these situations. Furthermore, teachers should also improve their mathematics skills that had already been possessed in performing the learning process. Okigbo and Okeke (2011) stated that the teachers' weak mathematical skills in performing the learning process might be the cause of the students' high rate of failure.

The students' being confused and having difficulties in dealing with the combination of geometry concepts and the students' not understanding the test item visualization and information became two other problems. These difficulties might be overcome by deploying 3D learning media that took the form of geometrical buildings that might be combined from one to another. Similar statement was also provided by Ozerem (2012); he suggested that teachers deployed display tools in their learning

process in order to assist the students in understanding the concepts. Learning media that had been deployed in the learning process might be made of wood, plastic, glass and other materials that could be found easily from the surrounding environment. In addition, teachers might also benefit the technological advance in the form of operating applications that had been made to ease the learning process, such as Geogebra. The use of Geogebra or any other applications might ease the students in understanding geometry concepts and in visualizing geometrical shapes. Leaning by application might also increase the students' interest in attending the learning process so that the students will be more interested and more motivated during their learning time. Another suggestion is teacher uses teaching aids (Gloria, 2015). The use of such media would not only clarify the concepts that the students mastered in the combination of geometrical buildings but would also help the students in terms of visualization so that the students would understand the concepts and the intentions of geometry test items better. Unfortunately, despite the use of learning media teachers still were not allowed to assume that the students might automatically understand how to use the learning media (Cope, 2015). Teachers should perform their active role in the students' learning process until the students completely understood the geometry concepts under study. The students who had understood geometry concepts and might visualize these concepts well would not merely memorize the formulas for solving geometry problems in the national examination.

The students' difficulties in relation to computation, mathematical representation and weak ability in applying geometry concepts into the cases that were similar to the ones that had been studied might be overcome by providing routine exercises toward the students. Okigbo and Okeke (2011) suggested that mathematical skills had usually been related to the repetitive application of mathematics concepts so that the students might solve multiple mathematics-related problems. That suggestion in in line with Gloria (2015, p. 54)," Routine exercises provided toward the students by means of various test items, both the similar and the different ones, might improve the students' computation and accuracy. In addition, the provision of the various test items might also increase the students' repertory of geometry-type test items so that when they should complete geometry test items of the national examination with similar concepts yet different models the students would not have any difficulties. The more the students completed geometry test items, the more increasing the students' ability in identifying the insights both implicitly and explicitly written in the test items. Furthermore, the more the students had been able to identify the provided information, the more the students would maximize the use of the information that they had identified in completing geometry test items that they dealt with.

Based on the results of focus group discussion and the discussions of students' difficulties in dealing with geometry test items of the national examination, the researchers have found that there have been 40.80%-49.48% of Indonesian junior high school students who are able to complete geometry test items of the national examination. The students' difficulties include four main topics namely the lack of understanding toward the students' geometry concepts, the lack of ability in associating geometry concepts and computation techniques in order to solve problems and the limited ability of mathematical visualization and representation. The collaboration of government's and teachers' role is deemed necessary in order to over the students' difficulties in dealing with the national examination, especially in the part of geometry test items. The role that the government might take, then, will be issuing policies for better education throughout Indonesia and such policies might include integrating information and communication technology into the learning process. One the other hand, the role that the teachers might take will be identifying the students' difficulties so that they can create a learning process that might be dealing with the students' difficulties.

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