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The Fourth International Conference on Combinatorics, Graph Theory, and Network Topology 2020

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The Fourth International Conference on Combinatorics, Graph Theory, and Network Topology 2020

Dafik

Editor in Chief of The Fourth International Conference on Combinatorics, Graph Theory, and Network Topology 2020
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We gratefully acknowledge the presence of all participants on "The Fourth International Conference on Combinatorics, Graph Theory, and Network Topology (ICCGANT)". It is the 4th International conference of the CGANT Research Group to be held on 22-23 August 2020 by the University of Jember in collaboration with the Indonesian Combinatorics Society (INACOMBS). The conference welcome participants from several countries, with a wide and varied variety of mathematics research interests, in particular combinatorial research. It has been an annual international conference where members of society organizations, research students, educators and researchers, writers, physicists, teachers and practitioners meet and exchange ideas to communicate and discuss theoretical and practical knowledge of mathematical research and its applications. The aim of the fourth conference is to present and discuss the latest research that leads to the exchange of new theoretical, analytical and scientific knowledge and bring it to a deeper understanding of the fields of mathematics, application of mathematics, and mathematics education. The topics of this conference have been displayed on the ic.cgant.unej.ac.id website.

The conference was undertaken in dual modes, namely virtual and face-to-face basis, either for the plenary and parallel session. We invited five speakers in the plenary session. They are from Australia, India, and Indonesia. In detail, Prof Adil Baghirov, Ph.D and Dr Joe Ryan are from Australia, Dr. M. Venkatachalam from India, and Prof. Dr. Basuki Widodo, M.Sc., and Prof. Drs. Slamin, M. Comp. Sc, Ph.D are from Indonesia. Due to the travel restriction in the Covid-19 outbreak, the speakers from abroad delivered their slide presentation virtually, as well as the participants who stay far from Jember town joined the conference virtually by using ZOOM cloud meeting. For attaching and submitting the abstract and manuscript of the conference, we use online platform, namely Easychair system. The participants who stay nearby Jember town, they joined the conference in face-to-face basis. We had 58 participants were joining in person. They were placed in two classrooms respected to the medical protocol for Covid 19. Thus, each room of 98 m^2 area consisted of 29 participants. The time spent for each speaker was 60 minutes, and Q/A session after plenary session was run within 30 minutes. The total number of participants was 186 people, and the number of submission received by ICCGANT 2020 committee was 147. The number of paper sent to reviewer was 105 papers, and the number of accepted submission papers is 86 papers. Thus the acceptance rate is 58.5%.

The participants of ICCGANT 2020 were a bit less than the participant of ICCGANT 2019, since this year's conference was held coincidentally with the Covid-19 outbreak. However, the pandemic does not stop us to carry out researchers, we have been still hardly working on this job and persistently motivated the participants to finish their papers for publication. Finally, we have successfully selected some papers to be published on IOP Conference Series: Journal of Physics of 86 papers.

Furthermore, on behalf of the organizing committee, we thankfully accept the support of this conference from the University of Jember. We would also like to express our sincere gratitude to all the lovely participants who have engaged in this unforgettable and important science forum.

Prof. Drs. Dafik, M.Sc., Ph.D
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All papers published in this volume of Journal of Physics: Conference Series have been peer reviewed through processes administered by the Editors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal published by IOP Publishing.

- **Type of peer review:** The type of peer review article is Double-blind review where the authors name and affiliation of the paper are hidden. The reviewer independently made some suggestion and corrections on the papers.

- **Conference submission management system:** All the papers were submitted online through EasyChair system https://easychair.org/conferences/?conf=iccgant2020

- **Number of submissions received:** 147

- **Number of submissions sent for review:** 105

- **Number of submissions accepted:** 86

- **Acceptance Rate (Number of Submissions Accepted / Number of Submissions Received X 100):** 58.5%

- **Average number of reviews per paper:** 3

- **Total number of reviewers involved:** 63

- **Any additional info on review process:** The reviewers gave some feedback to each paper based on the referring guidelines such as state of the art of research, methodology, gap, a proposed novelty, originality, and language. They also review the originality of the research finding, and the bibliography cited in their paper. In general they have made refereeing on three things, namely the content, layout, and language.

- **Contact person for queries:**
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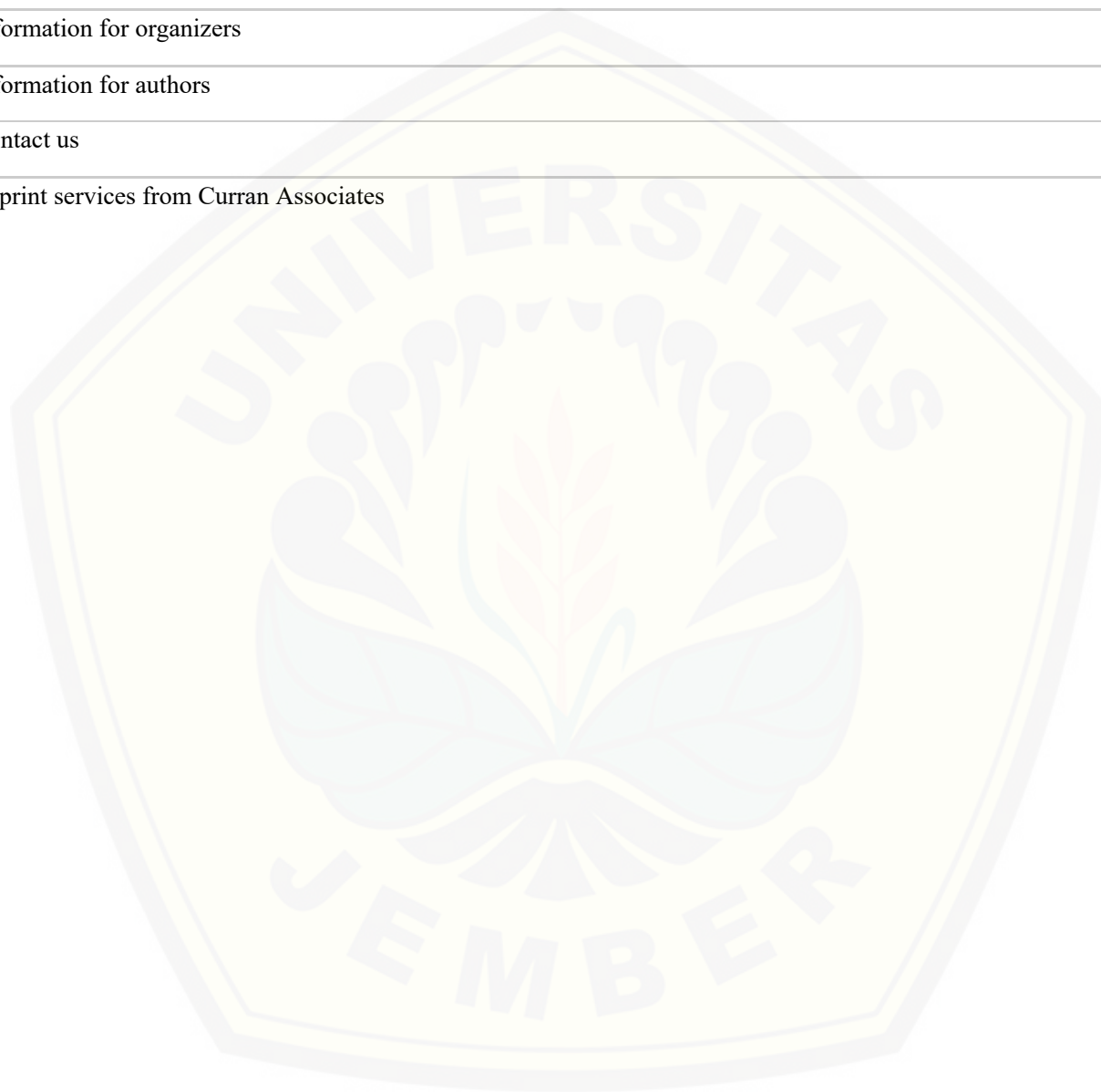
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The development of geometry test to analyze students' creative thinking skills in the area of square formula derivation

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The development of geometry test to analyze students' creative thinking skills in the area of square formula derivation

N R Aini[1], S Susanto[1,2,3], E Yudianto[1,3], H T Wijaya[1] and E Cahyanita[1]

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Abstract. Technology advances demand students to adapt creatively in solving problems. This research is development research with the intention of producing a certain product that validity, practicality, and effectiveness be tested, where the development process is described as thorough as possible then evaluated. This development of geometry test used Thiagarajan model or known as 4-D consisting of define, design, develop, disseminate stage. Geometry test that have been developed are used to describe students' creative thinking skills. This creative thinking is divided into four things that are fluency, flexibility, elaboration, originality. The subjects in this research were 3 students of 32 Junior High School Class consisting of students in visualization, analysis and informal deduction level. Data retrieval in this research was done by using a test and interview. Based on the research result data, three students fulfilled creative thinking skills, among them student was classified as the category of quite creative (TKBK 2), who were fulfilling the indicator of fluency and flexibility, student was classified as the category of less creative (TKBK 1), who were fulfilling the indicator fluency, and student was classified as the category of creative (TKBK 3) so that fulfilling the indicator of fluency, flexibility, originality.

1. Introduction

The fourth industrial revolution or industry 4.0 informs that a broader process from digital transformation of society affects not only business and organization, but also it affects education [1]. Education is a facility to increase human resources who are smart and able to compete in the future. When entering life in society and the working world, the concept of education will be more important because students have to be able to apply skills obtained in the school to face the problem that happened [2]. Currently, artificial intelligence has been much developed, but what becomes the distinction key between human and artificial intelligence is creativity [3]. One of the subjects supporting students' skills in the working world and society is mathematics.

Mathematics relates to not only problem-solving skills daily but also skills in using imagination, intuition, reasoning to discover new ideas [4]. One of the important aspects of mathematical understanding is by focusing on mathematical concepts [5]. Some math education experts showed that one of the ways to make a supportive learning environment of mathematical understanding is by explaining the effective use of some representation of mathematical ideas, including the learning environment that can help students to develop a deep understanding of mathematics [6]. A teacher has a purpose to teach mathematics for provisions for the student to have creative, logic, systematic, and critical thinking skills [7].

The teacher is one of the important actors in increasing creativity in students [8]. The teacher is expected to be able to support students' creative thinking. The facility given by the teacher to be able to increase creative thinking skills is by giving tests. The first approach is by facilitating with giving summative assessment, and the second is giving formative assessment aiming to understand creativity as a part of education [9]. Based on the research results showed that there were still many students having low creative thinking skills in solving geometry problem[10].

According to TIMSS data in 2015, Indonesia experiences a decline by standing on the 45th order of 50 countries and gets a mathematics score that is 397 points. While from the geometry aspect, Indonesian students' skills reach 28 of 50 [11]. Students often have trouble in geometry learning, the way that can be used to help students' difficulty is by applying van Hiele learning theory. Van Hiele described the geometric thinking model into three aspects that are the existence of van Hiele levels, the properties of each level, and the progress from one level to the next level [12]. The language used in giving instruction also affects students in the level attainment of higher-order geometry skills [13]. Geometry learning needs a good planting of concepts, the teacher can help the student to understand the concept so that geometry subject has been no longer feared by students.

The teacher can facilitate the student with giving geometry skill test to students. The test can be used to plant mathematical concepts as well as to measure how far students understand about the course. By practicing students to work on instruments in the form of tests related to the planting of concepts and also creative thinking skills will increase thinking skills more so that the quality of students increases, then the quality of human resources can also increase.

2. Method

This type of research was Development Research aiming to produce a certain product, and then the validity, practicality, and effectiveness would be tested. The development of this research used Thiagarajan model of 4-D Model that was define, design, develop, disseminate [14]. In this research, the product that was developed was a geometry test package of the area of shape formula derivation which was next used to analyze students' creative thinking skills based on van Hiele levels.

The defining stage aimed to set and define development requirements as well as set and define learning needs by analyzing the purpose and material discussion. At this activity, an observation would be done by using the documentation method. The observation was done by analyzing students' geometry skill levels by using Van Hiele Geometry Test. After that, a grouping of each student was done to each van hiele's level.

Designing stage aimed to design a test package in the form of a test package consisting of test preparation, media selection, format selection, initial design. The developing stage was done to produce draft II in the form of a test package that had been revised based on the feedback from the experts and the data obtained from the testing. The test package that had been produced into draft II was next tested to the students who would be the research subjects. The testing that was done used a geometry test package.

This disseminating stage was done after the geometry test was tested and had fulfilled validity and effectiveness levels. The dissemination of the geometry test was conducted through an introduction to students, then the student was also given a response questionnaire to follow the activity.

Data resource or subject used in this research was students of Junior High School class IX. The subject selection technique was by a way that subject was firstly grouped based on geometry skill level with giving geometry skill test. The data from van Hiele levels was obtained, then the student would be retrieved with snowball sampling method until the information obtained each level reached saturation point. The geometry skill test used to group students was Van Hiele Geometry Test (VHGT) in the form of a multiple-choice test containing 25 questions compiled into five geometry thinking levels that were visualization, analysis, informal deduction, deduction, and rigor.

The test package that had been developed by the procedure as the figure above and had been stated as valid by the expert validator, then it would be used to analyze students' creative thinking skills. Students who had been grouped based on geometry skill level, each student with different levels would be given a geometry test package. Data that was obtained then would be analyzed to see students' creative thinking skills by their level in solving geometry test package. The next technique was by doing an interview, that was a meeting between two people in sharing information as well as ideas through question and answer so that the meaning at a certain topic could be constructed [15]. The interview that was done with the selected subject was conducted under the interview guidelines that had been arranged to express students' creative thinking skills.

Indicator of students' creative thinking skills in purposing the problem used in this research was as follows.

Table 1. The Indicator of Creative Thinking.

Aspect	Indicator
Fluency	Students could express more than one answer to find the area of square formula.
	Students were fluent in expressing their ideas.
Flexibility	Students could give various ways to find the area of square formula.
Originality	Students could give an answer based on the different solutions or new ideas with other students in solving the area of square formula.
Elaboration	Students could develop, add, enrich, an idea.

**Table 2.** The Characteristic of Creative Thinking Levels.

Level	Category	Score
TKBK 4	Level 4 (Very Creative)	$80 < NP \leq 100$
TKBK 3	Level 3 (Creative)	$60 < NP \leq 80$
TKBK 2	Level 2 (Quite Creative)	$40 < NP \leq 60$
TKBK 1	Level 1 (Less Creative)	$20 < NP \leq 40$
TKBK 0	Level 0 (Not Creative)	$0 < NP \leq 20$

3. Result

The development in this research was the development of a test package aiming to analyze students' creative thinking skills of Junior High School 1 Jember in the area of square formula derivation based on van Hiele levels. The subjects used were 3 of 32 students consisting of visualization level, analysis level, and informal deduction level. The problem existing in the test package was in the form of essay questions. Besides the test package, the researcher also developed other instruments such as scoring guidelines, test package blueprint, and also legibility questionnaire of the test package. Before the development process was done, a question quality criterion of creative thinking was first set to see how successful a product produced which was by seeing the result of validity, reliability, and difficulty levels.

This creative thinking question is proper to use to identify Junior High School students' creative thinking skills if the criteria of validity, practicality, and effectiveness were fulfilled. 1) validity level of the creative thinking questions used in this research was $0.6 < |\alpha| \leq 0,8$, the validity level of the test package in this research by two people validators was 0.7 with high interpretation category. 2) practicality level of the creative thinking questions used in this research was $80\% < P \leq 95\%$, the percentage level practicality obtained from this research was 85% with a good category. 3) analysis of effectiveness, this test package is said to be effective if 80% of the testing subject researched fulfilled minimal completeness criteria (KKM).

The following is the result of geometry test development in the subject of the area of parallelogram formula derivation.
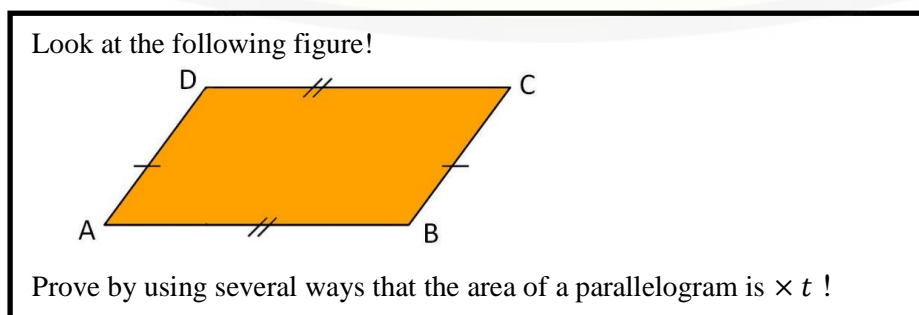
Figure 1. Geometry test.

Based on the analysis result of test and interview data on the subject related to creative thinking problems, then it was obtained a research result as follows.

3.1 The student with level 0 or visualization.

The following is the question solution of creative thinking in the area of parallelogram formula derivation by visualization subject.

Based on the test and interview results that had been firstly validated, it was known that subject 1 could fulfill the aspect of fluently in thinking because able to answer with one way, calculation process, and the result was correct. Student subject 1 in the aspect of originality could answer in their way, even though not understandable. In the interview activity, the student could not explain the solution that was not already solved in the answer sheet. In the aspect of fluently, the student could give an idea that was not relevant to the problem-solution even though not able to solve it until getting the answer. On subject 1 student in the aspect of elaboration, there was an error in answering and not accompanied by the detail on the 2nd way solution in finding formula derivation on the area of a parallelogram. Thus, on the score of student subject 2's creative thinking, it obtained a score of 31.25 so that it was included in the category of TKBK 1 or less creative.

The following is the interview with subject 1 or subject 1 with visualization level.

P   : Have you ever solved this question before?

S1 : No, Ms.

P   : How many ways can you solve the questions given?

S1 : 2 Ms, but one did not finish.

P   : Please try to explain using your language about the answer that has not been solved yet.

S1 : Sorry Ms, I can't.

Figure 2. The answer of student 1.

3.2 The student with level 1 or analysis

The following is the question solution of creative thinking in the area of parallelogram formula derivation by analysis subject

Based on the answer of student 2 above, it could be known that the student fulfilled the aspect of fluently that the student could produce at least one way to solve the relevant problem correctly. In the aspect of fluently, the student could solve the problem by producing other uniform ideas. The student with the analytical skills in the aspect of novelty, they could not give different or unique solution answer. Student subject 2 in the aspect of elaboration could give a correct answer but less detail in solving creative thinking questions in the area of parallelogram formula derivation. Thus, based on the

explanation above, student subject 2 got a creative thinking score of 50 where the score fulfilled the category of TKBK 2 or quite creative.

The following is the interview with subject 2 or subject 2 with analysis level.

P   : Have you ever solved this question before?
S1 : No, I haven't Ms.
P   : How many ways can you solve the questions given?
S1 : I solved with 2 ways, Ms.
P   : Is there any other possible way to solve the question?
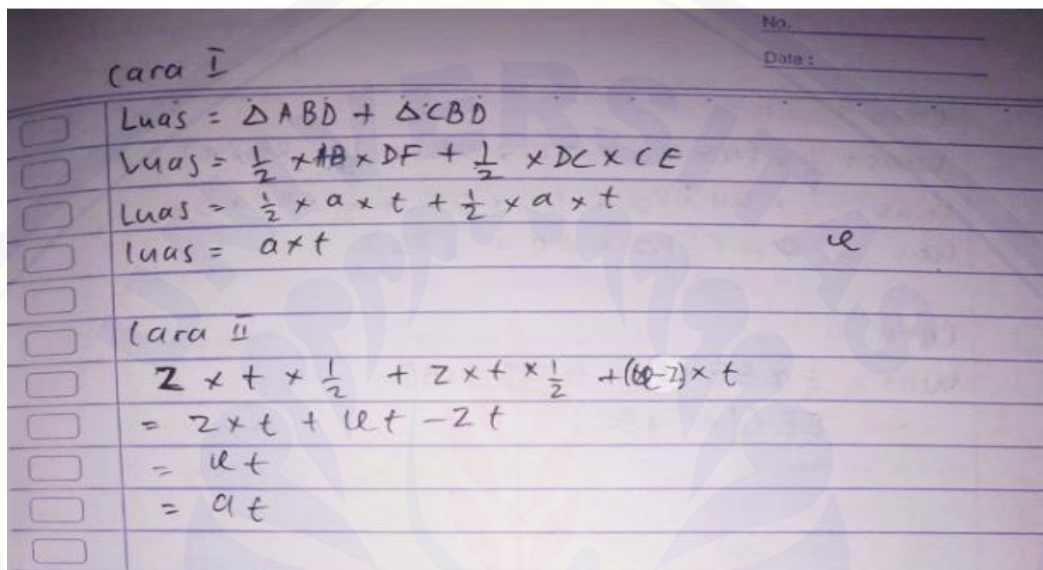S1 : No Ms, I think that's all.

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Figure 3. The answer of student 2.

3.3 The student with level 2 or informal deduction.

The following is the question solution of creative thinking in the area of parallelogram formula derivation by informal deduction subject.
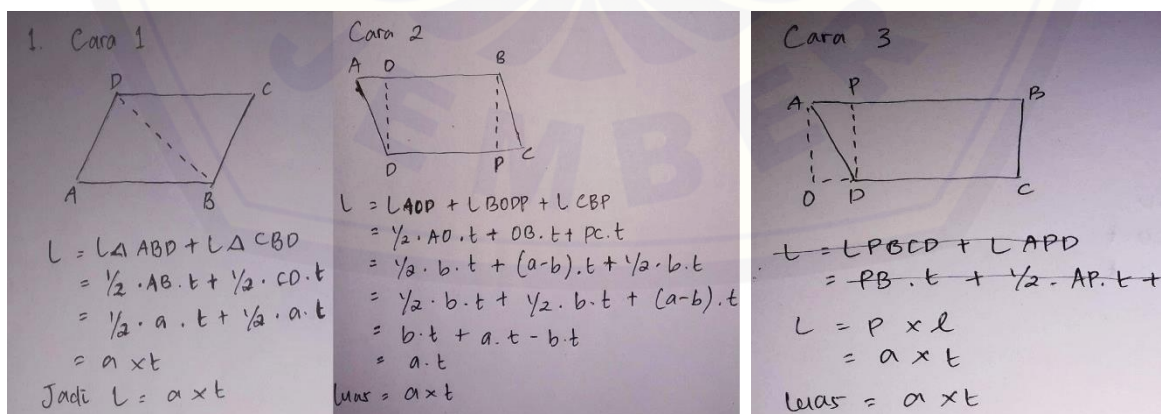

Figure 4. The answer of student 3.

Based on the answer of student subject 3 above, it could be known that the student with informal deduction skills could fulfill the aspect of fluently that the student could produce more than one relevant idea and the solution was correct and clear. In the aspect of elaboration, student subject 3 in

solving the area of parallelogram formula derivation could give a correct answer but the 3rd way used was less detail, when asked to explain in the interview, the student did not understand what had been done in the third way. The student fulfilled the aspect of fluently because the student could solve the problem by producing other not uniform ideas correctly. In the aspect of novelty, student subject 3 could give different or unique solution answer correctly. Thus, from the results above, student subject 3 got a creative thinking score of 75 with the category of TKBK 3 or creative.

The following is the interview with subject 2 or subject 2 with analysis level.

P : Have you ever solved this question before?

S1 : I haven't ever solve this kind of question, Ms

P : How many ways can you solve the questions given?

S1 : I solved with three ways Ms, but the third one I wasn't really sure.

P : Can you explain with your language about the answer to the third way?

S1 : I wanted to find the area of a parallelogram by using the area of a rectangle, Ms.

The results in the research showed there was a difference obtained from students with different geometry level skills. To be able to produce higher creative thinking skills, the role of a teacher is needed to train students' creative thinking skills. It can produce too by increasing the quality of mathematics learning in the class. Learning quality in the class should match the current literature considering that the importance of creative thinking for students to produce and gain knowledge, as well as to hone students in finding ideas to solve problems and to find the solution.

3. Conclusions

The developed test package had fulfilled the criteria of valid, practical, and effective after testing so that the test package could be used to analyze students' creative thinking skills. Based on the analysis results, it was obtained that the student with level 0 or visualization. Fulfilled the aspect of fluency in creative thinking so that it was included in the category of Creative Thinking Ability Level (TKBK) 1 or less creative. The student who had analysis level skills fulfilled the aspect of fluency and flexibility so that it was included in the criteria of Creative Thinking Ability Level (TKBK) 2 or quite creative. While the level 2 or informal deduction student could fulfill the aspect of fluency, flexibility, and originality in creative thinking so that it was included in the category of Creative Thinking Ability Level (TKBK) 3 or creative.

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