Developing didactic design in triangle and rectangular toward students mathematical creative thinking through Visual Basic for PowerPoint

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Abstract. Triangle and quadrilateral material has been studied since the students are in elementary school, but the junior high school students still struggle to solve problems related to triangle and quadrilateral. The research method used in this research is a qualitative method with Didactic Design Research (DDR) approach. DDR is research conducted through three stages didactic situation analysis before learning which its form is Didactic Hypothesis Design, meta didactic analysis, and retrospective analysis. It's defined as an analysis which relates the result of didactic hypothesis analysis and the result of the meta didactic analysis. Based on the results of the analysis shows that learning by using didactic design in teaching triangle and quadrilateral, students can work through the completion of visual essential PowerPoint. Study and observation of the writers when learning takes place, the difficulties faced by students in solving the problem of mathematical creative ability is that students not usually used it for facing issues with indicators of the artistic knowledge of mathematics. So, in general, some students from both classes have depicted to the student's creativity in solving the problem, but there is no answer, and the level of thinking is low.

1. Introduction
Creative thinking ability is necessary for the learning of geometry. Geometry is one of the branches of science in mathematics. In the process of learning mathematics, geometry plays a significant role because of a lot of concepts in geometry that can spur the creativity of students in solving a problem that exists in mathematics. The purpose of learning geometry include 1) developing the ability of creative thinking, 2) developing intuition, 3) teaching knowledge, 4) teaching how to read and interpret mathematical arguments. It comes along with Dan and Xie the ability in mathematical modeling of students can improve students' creative talent [1].

In the topic of geometry, there are sub topics of triangle and quadrilateral and quadrilateral. Although the triangle and quadrilateral material has been studied since the students are in elementary school, but the junior high school students still struggle to solve problems related to triangle and quadrilateral and quadrilateral. Efforts to improve creative thinking in mathematics is rarely or never developed. The ability is essential so that students can acquire, manage and utilize information that is always changing. Creative ability is part of what we called as expertise in developing the capabilities that are needed to master the technology. It comes along with Romero, Lepage and Lille the use of creative technology can help students in solving problems so that cognitive abilities are well developed [2].
or mastery of digital technology requires precision so that what is produced can be further developed. Students' thinking in developing technological mastery is critical because students' pattern is more active [2]. It comes along with Bartsch students prefer learning using PowerPoint because students have a better exploration of their creative thinking ability [3]. In addition to the teacher, students are more helpful in the presentation of the presented material [3].

Creative thinking can be interpreted as a way of thinking to develop a problem and see it from a different perspective. Creative thinking can also be interpreted as a mental activity that someone uses to build new idea or ideas. Creative thinking is a mental activity that requires perseverance, self-discipline, and mindfulness [4]. Mental activity which: (1) asks questions, (2) new information and unusual ideas with open minds, (3) builds interrelations especially different things, (4) freely interconnects, 5) implies imagination at every situation to produce different things, (6) listening to intuition.

The ability to think creatively is not instinctive, it must go through the process of training. It comes along with Langrehr to train students to think creatively to answer questions relating to the following [5]: (1) creating a combination of some newly formed parts; (2) using the random features of an object arising from an existing design to a new model; (3) eliminating a part of something so as to produce something new; (4) alternative usability thinking of something that creates new uses; (5) constructing ideas that are contrary to opinions that are commonly used by people who form new concepts; (6) determining the utility of the extreme form of an object to discover the further usefulness of the object.

There are four criteria for the ability to think are Skill/fluency creatively: sparkling many ideas, answers, ways or suggestions of problems or questions, Flexibility: ideas, alternative answers, or queries varying, authenticity: giving birth to a new and unique phrase elaboration: develop an idea or product. Khlaifat and Rifai [6] Visual shows how to create a graphical user interface (GUI). Using this method does not need to be instructed in programming by line codes. Primarily (Beginners All-Purpose Symbolic Instruction Code) in other words is a programming language for compiling an app [7]. Utilizing Visual Basic and PowerPoint by combining both good results, and students can perform analysis in finding solutions with maximum results [6]. It comes along with Khlaifat and Rifai Visual Basic and PowerPoint are very useful to compute the current problem [6]. Problems that arise outside the didactic situation associated with teacher-student relationships are no less subject to study so that math learning can always be improved. The situation associated with the teacher-student relationship will then be referred to as a pedagogical situation (pedagogical situation). It can be seen as the figure 1:

![Figure 1. Didactic strategy modification.](image)

2. Method

The research method used in this research is a qualitative method with Didactic Design Research approach (DDR). Didactic Design Research is research conducted through three stages, that is didactic situation analysis before learning; Didactic Hypothesis Design, meta didactic analysis, and retrospective analysis, that is an analysis which relates result of didactic situation analysis hypothesis with the result of meta didactic analysis. In general, three stages are consisting of:

2.1. Stage 1: analysis of dictation situation before learning

1) Determining the material, 2) Search the literature, 3) Analyze the material, 4) Instrumentation, in the form of Respondent Capability Test (TKR), 5) Implementing the initial TKR to find out the learning difficulties to students who have obtained the material triangle and quadrilateral and rectangle. 6)
Analyze the results from early TKR to identify students' learning difficulties, 7) Prepare the didactic design of triangular and rectangular material, 8) Created predictive student responses that may arise when didactic designs are implemented and prepare for the anticipation of possible student responses

2.2. Stage 2: metaped analysis is noticed
1) Implemented didactic designs that have been compiled, 2) Analyze situations, student responses, and anticipate student responses when didactic designs are implemented

2.3. Stage 3: retrospective analysis
1) Associate predictive responses and anticipations with student responses that occurred during the implementation of didactic design, 2) Implementing Final Response Capability Test, 3) Analyze in the final TKR, 4) Analyze the effectiveness of the didactic design, 5) Prepare research report.

The instrument used in this study is the Resilient Capability Test (TKR) which consists of 5 description questions, Respondent Ability Test is given twice, namely early TKR and final TKR. The purpose of the initial TKR was to determine the creative ability of mathematics related to triangle and rectangular and quadrilateral materials. The final TKR of the instrument is used to determine whether students' difficulties in honing their creative mathematical abilities are still present or not after the implementation of the didactic design. Before the TKR, the first test instrument is validated through expert judgment.

3. Results and discussion
The average of the students on the pretest result of the control class is 4.56, and the average of the pretest result in the experimental class is 4.69. There is the difference in pretest averages of both classes of 0.13 so that the preliminary class is superior to the control class. While for pretest on the control class is 1.68 and standard deviation pretest in experimental class is 1.85. Then there is the difference of standard deviation of pretest of the two classes that is 0.17 so that in the experiment class the spread is better than the control class. Then based on SMI graduation rate from students of pretest result of control class that is 22.8% and based on SMI graduation rate of students result of pretest in experiment class is 23.45%. Then the difference in the percentage of the two classes is 0.65% so that the pass rate of students in the experimental class is better than the control class.

The average of the students in the posttest result of the control class is 10.22, and the mean of the posttest result in the experimental class is 12.61. There is the difference of posttest average of the two classes is 2.39 so that the experimental class is superior to the control class.

The standard deviation of posttest in the control class is 2.01, and the standard deviation of posttest in the experimental class is 3.04. There is the difference of standard deviation of posttest of the two classes that is 1.03 so that the distribution of experiment class is better than the control class. Based on the SMI graduation rate of the students of posttest control results is 51.10% and based on the SMI graduation rate of students' posttest in experiment class is 63.05%. Then the difference in the percentage of the two classes is 11.95% so that the pass rate of students in the experimental class is better than the control class.

The average N-Gain control class is 0.36 (medium), and the standard deviation is 0.15. While for average N-Gain experiment class is 0.52 (medium), and standard deviation equal to 0.19. From the average N-Gain result shows that the average of N-Gain in the control class is smaller than the average of N-gain in the experimental class that has the difference of 0.16, hence, it can be interpreted that there is an improvement of the Mathematics Creative thinking ability of junior high school student. For a standard deviation n-Gain control class with experiment class, there is a difference of 0.04 so that it can be interpreted experiment class has better dissemination.

An indicator of Mathematical Creative ability in this research is 1) to formulate a mathematical hypothesis based on causal relationship, 2) determine the mathematical pattern, 3) propose a new solution, 4) propose an unusual idea, 5) identify missing information, 6) detail the problem. Specifies the area of the triangle with the Outside of Square Rectangle Concept.
Work on the shape of the triangle image is in figure 2. By entering the image type from the Insert menu, after that select Shapes. From Shapes select the image corresponding to image 1 into Slide 2.

There are some students who are still not familiar in formulating mathematical hypothesis based on causal relationship so it is still confused to distinguish the type of triangle and rectangle based on the length of its sides with the type of triangle and rectangle based on the large angle. But there are already students who can reflect the aspects of fluency based on causality mathematically well. Corebima, Susilo and Zubaidah states in such learning students 'potential in creative thinking can be improved by empowering students' self-confidence [8].

Aspects of the flexibility of thinking in explaining quadrilateral properties regarding angles and diagonals. Next create a command using Visual Basic for PowerPoint, which will be inserted into a particular type of shapes to display the triangle, intersect the triangle, move and rotate the triangle pieces.

```
End Sub
Sub temp10()
ActivePresentation.Slides(2).Shapes("segitiga1"), Visible = msoTrue
ActivePresentation.Slides(2).Shapes("segitiga2"), Visible = msoFalse
ActivePresentation.Slides(2).Shapes("segitiga3"), Visible = msoFalse
ActivePresentation.Slides(2).Shapes("segitiga4"), Visible = msoFalse
End Sub
Sub temp11()
ActivePresentation.Slides(2).Shapes("kotak11"), TextFrame.TextRange.Text = "1"
End Sub
Sub cmd1()
ActivePresentation.Slides(2).Shapes("kotak11"), TextFrame.TextRange.Text = "2"
End Sub
Sub cmd2()
ActivePresentation.Slides(2).Shapes("kotak11"), TextFrame.TextRange.Text = "3"
End Sub
Sub cmd3()
ActivePresentation.Slides(2).Shapes("kotak11"), TextFrame.TextRange.Text = "4"
End Sub
Sub temp1()
ActivePresentation.Slides(2).Shapes("segitiga1" & "segitiga2" & "segitiga3" & "segitiga4"), TextFrame.TextRange.Text = "1"
ActivePresentation.Slides(2).Shapes("nila1"), TextFrame.TextRange.Text = "2"
ActivePresentation.Slides(2).Shapes("nila2"), TextFrame.TextRange.Text = "3"
ActivePresentation.Slides(2).Shapes("nila3"), TextFrame.TextRange.Text = "4"
End Sub
```

Aspects of the flexibility of thinking in explaining quadrilateral properties regarding angles and diagonals. Next create a command using Visual Basic for PowerPoint, which will be inserted into a particular type of shapes to display the triangle, intersect the triangle, move and rotate the triangle pieces.

```
Sub cmdAsas1()
ActivePresentation.Slides(2).Shapes("segitiga1" & "segitiga2" & "segitiga3" & "segitiga4"), TextFrame.TextRange.Text = "1"
ActivePresentation.Slides(2).Shapes("kotak11"), TextFrame.TextRange.Text = "2"
IncrementTop = - 30
ActivePresentation.Slides(2).Shapes("nila1"), TextFrame.TextRange.Text = "1"
End Sub
Sub cmdAsas2()
ActivePresentation.Slides(2).Shapes("segitiga1" & "segitiga2" & "segitiga3" & "segitiga4"), TextFrame.TextRange.Text = "2"
ActivePresentation.Slides(2).Shapes("kotak11"), TextFrame.TextRange.Text = "3"
IncrementTop = - 30
ActivePresentation.Slides(2).Shapes("nila1"), TextFrame.TextRange.Text = "2"
End Sub
Sub cmdAsas3()
ActivePresentation.Slides(2).Shapes("segitiga1" & "segitiga2" & "segitiga3" & "segitiga4"), TextFrame.TextRange.Text = "3"
ActivePresentation.Slides(2).Shapes("kotak11"), TextFrame.TextRange.Text = "4"
IncrementTop = - 30
ActivePresentation.Slides(2).Shapes("nila1"), TextFrame.TextRange.Text = "3"
End Sub
Sub cmdAsas4()
ActivePresentation.Slides(2).Shapes("segitiga1" & "segitiga2" & "segitiga3" & "segitiga4"), TextFrame.TextRange.Text = "4"
ActivePresentation.Slides(2).Shapes("kotak11"), TextFrame.TextRange.Text = "5"
IncrementTop = - 30
ActivePresentation.Slides(2).Shapes("nila1"), TextFrame.TextRange.Text = "4"
End Sub
```

**Figure 2.** Results from Visual Basic for PowerPoint.

Based on the analysis of pretest data of control class and experiment class, there is no significant difference in initial ability between control class and experiment class. Then obtained the ability of the first ability of Creative Mathematics in the two classes are given different treatment, namely in class VII-I as a class of control using ordinary learning and in-class VII-J as an experimental class by using the didactic design on triangular and quadrilateral topics through visual learning basic for PowerPoint.
Learning activities in the control class are based on ordinary learning, so there is no particular treatment so that the learning process takes place as usual with the lecture method. This is in line with [9] teachers pay attention, consider and memebrikan opportunities to students through technology so that students’ creative ability is better. As for the experimental learning activities based on experimental stages didactic design on triangular and quadrilateral topics, i.e., students can develop the knowledge they already have on the material given by the teacher (kontruktivisme), then can find new mathematical ideas on the material being studied (found), and establish a question and answer system about the material that is not understood (ask). Furthermore, the teacher guides the students to sit in groups to work on the LKS that teachers provide (community learning). After all, groups complete the LKS, the teacher encourages group representatives to present their discussion results in the classroom (modeling). In the next stage of reflection activities that teachers encourage students to conclude the results of learning activities that have been studied, then recorded in the book notes (reflection). At the end of the teacher’s learning activities provide an objective assessment (authentic assessment). In the second to fourth meeting students are still less active, difficulty conveying mathematical ideas, and embarrassed to present the students' work because students are not used to learning by using didactic design through Visual Basic for PowerPoint learning on triangular and quadrilateral topics, then at the fifth meeting the ninth students are more active, able to communicate mathematical ideas, motivated to present their work in front of the class, and ask if there is work from other groups that are considered different so that the classroom atmosphere is more active and more conducive. This is in line with Kaufman and Baer [10] in general; students see themselves as creative in one area, it does not correlate with the students in solving problems that exist in mathematics.

Then at the tenth meeting given the postest for the control class and the experimental class aims to assess the final ability of Mathematical Creative ability in each student after being given treatment, that is in class VII-I as control class by using ordinary learning and in-class VII-J as experiment class with using didactic design on triangular and quadrilateral and quadrilateral topics through essential visual learning for PowerPoint.

In both classes, students generally have difficulties in indicating the daily events in the math language; the students are still having difficulties with the variables because the students are used to solve the problem that there are no variables and there are students still confused with the two-dimensional area. Students still have difficulty in solving the Mathematical Creative ability with indicators stating daily events in language or mathematical symbols [8].

4. Conclusion

Based on the results of the analysis shows that learning by using the didactic design on the topic of triangle and quadrilateral students can work through the completion of obvious essential PowerPoint. Analysis and observation of the author when learning takes place, the difficulties faced by students in solving the problem of mathematical creative ability is not usually used by students facing problems with indicators of the creative knowledge of mathematics. So, in general, some students from both classes have depicted to the students creative in solving the problem, but there is no answer, and the level of thought is low.
Acknowledgments
Thanks to the IKIP Siliwangi which has supported this research in the form of funding through internal lecturer research grant. And also support the provision of a place in the laboratory mathematical equipment and computer labs, so researchers can develop Microsoft Excel software that is associated with props so that students can easily learn math.

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