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Foreword

Praise be to God Almighty so that the Proceedings of the 2018 International Conference of Mathematics Analysis, It's Application and Learning (ICoMAAL 2018) organized by Sanata Dharma University and Mathematical Analysis Community of Indonesia can be completed. This Conference Proceedings contains the written versions of most of the contributions presented during at the ICoMAAL, which consisted of 25 articles from the speakers who came from various universities. The article has been presented on 15 September 2018 at the ICoMAAL conference and has been reviewed and revised accordingly suggestions from reviewers.

Many thanks go as well to All Keynote Speakers, Steering Committee and Organizing Committee for the success of this conference and to all people who participated for the process of proofread of the contributed papers and in preparing this proceedings.

Yogyakarta, October 2018

Chairman of the committee
Febi Sanjaya, M.Sc.

TABLE OF CONTENTS

Integrating GeoGebra into Geometry Learning: A Lesson from Traditional *Osing* House Structures

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Abstract. Some studies stated that mathematical ideas sometimes could be derived through a cultural-based habit or activities. Including how the Osing, Banyuwangi tribal ethnic in Indonesia structure their house by using a simple geometrical concept. This study tries to explore more how university students who struggling in making sense two dimension shapes concepts can be inspired by observing how *Osing* people doing a simple mathematical explanation in building their traditional house. Besides, as one of dynamic software that dedicated specially to help in understanding algebra and geometry altogether, GeoGebra software seems to be a great idea to be integrated into university level geometry learning. To that end, a study was conducted in order to know how the Osing ways in structuring their house can help some mathematics education students at University of Jember to do a better way in making sense of two dimensional shapes concepts. After doing some research phases, a positive response related to the use of GeoGebra is achieved and the use of GeoGebra during their geometry lesson can help in setting up effective geometry learning.

Keywords: GeoGebra, Osing, Banyuwangi

1. Introduction

Recently, it cannot be avoided that science and technology become a major consideration in developing every aspects of human life, including how this two things can make a huge acceleration in setting up a better students' learning environment. Either science or technology is believed can provide a great opportunity for students to do a deep exploration of their understanding about a certain concept. Some technology-based learning tools that usually used during university level mathematics learning such as Maple, Matlab, GeoGebra, SPSS, or Fluent, the needs to find effective and efficient software to assist them in doing a better understanding still become educators' top concern. One of the suitable ways to gain students' better understanding is by using dynamic software called GeoGebra. Geogebra provides an interactive learning environment because it provides tools to manipulate data [6]. Geogebra also provides students to share their knowledge and their creative work in Mathematics [6]. Besides that, all of students from any level of knowledge can be encourage studying Mathematics by using Geogebra [7].

As one of branches in mathematics, geometry learning should be situated such that students can be easier to visualize the given geometrical concepts. As dynamic software that developed specially for gaining understanding in geometry and algebra, GeoGebra can be a stepping stone for undergraduate students to enhance and demonstrate their skills in proving geometrical theorems of two or three

dimensional objects. As a branch that closely related to visualization, the use of GeoGebra tends to help undergraduate students to be able to visualize equations or shape geometrically as well as could decrease undergraduate students' difficulties related to analyse, prove, or graph the given tasks. Geogebra fits the current trend in teaching mathematics for visualization technique [7].

Mathematical learning activities that situated based on a local environment is significantly can help student learn more deeply in geometry learning activities [1]. It means that geometry learning activities itself could preserve the culture. Besides students could extract the value contained in the proposed culture, students are also able to apply the values in their learning process, such as their empathy, tolerance, or even solidarity among different ethnics of their classmates.

Osing is a local Banyuwangi tribal ethnic in Indonesia that mostly lived in the eastern of Java island. Most of Osing people migrated from one region to other regions in order to have a good wealth or starting a new life. As one of the Osing's main destination of their life expansion, Jember is well known as the second home for Osing people. In term of the number of undergraduate students that study at University of Jember, almost half of its students is originated from Banyuwangi. By considering the huge amount of Osing people who study at University of Jember, it is reasonable to put the culture of Osing as the main consideration in developing the learning activities. The one that did by the university is by inserting Osing culture as one of seven excellent research that written on their 2016-2020 strategic plans (*rencana strategis*) for its productivity and welfare community [12].
This study did by considering the need to put Osing culture as the main consideration and the fact that more than 60% of the undergraduate students of mathematics education of University of Jember having achievement under 65 during their geometry learning. In accommodating the need inserting Osing culture in the most of university learning process, the need of increasing undergraduate student in making sense the certain concept in geometry, and the fact that GeoGebra is proved can help student understand more about geometry. This study has done by concerning on how to integrate GeoGebra into university geometry leaning.

2. Literature Review

2.1. Geometry Shape

Geometry is one of the important domains in Mathematics. Geometry requires the logical development for its fundamental principles. These fundamental principles are called the axioms of geometry [4]. Geometry learns fundamental principle that is called as axioms. There are five groups of axioms in Geometry, such that axioms of connection, axioms of order, axioms of parallels (Euclid's axiom), axioms of congruence, and axioms of continuity (Archimedes's axiom) [4]. Each of these groups expresses by itself the related fundamental principle in Geometry. Geometry course learns axioms of parallels (Euclid's axiom) about line and angle relationships, parallel lines, triangles, quadrilaterals, similar triangles, circle, and surface area also volume.

2.2. GeoGebra

GeoGebra is abbreviation from Geometry & Algebra. GeoGebra is designed by Markus Hohenwarter as Mathematics dynamic *software* that *open-source*. Geogebra could be download and used by the community in the world via website www.geogebra.com so that everyone can use and use of GeoGebra in complete problem [5].

GeoGebra becomes innovative learning tool that integrates technology in teaching and learning Mathematics [2]. GeoGebra also good in visualization and stimulation [3]. The use of GeoGebra could increase performance student in learning system coordinates [9]. GeoGebra also support the aim of learning Mathematics such that modelling real problem and making connection between real world and Mathematics [8].

There are seven menus in GeoGebra such that File, Edit, View, Options, Tools, Window, and Help. GeoGebra also have some tools to visualize Geometry two dimensional objects, such that points, lines, perpendicular lines, polygon, circle, ellipse, angle, reflect about line, slider, and move graphics

view. GeoGebra could visualize graphics in two or three dimension. The menus and tools help us to visualize Geometry object according to our purpose. We also could make colourful graphics with GeoGebra. Osing Traditional House

Osing ethnic is one of the ethnic in East Java. Osing Ethnic is original population of Banyuwangi, during Blambangan Kingdom. Osing community live in 9 districts, that is Banyuwangi, Rogojampi, Glagah, Singojuruh, Giri, Songgon, Cluring and Tile [11]. Osing ethnic uses Osing language which is derived directly from ancient Java but the accent is different.

Osing ethnic is called as original Banyuwangi community that feast to some village in middle and north part which has fertile agriculture. That villages are in the district Banyuwangi , Banyuwangi, Rogojampi, Glagah, Singojuruh, Giri, Songgon, Cluring and Tile district [11]. Osing ethnic has unique characteristic about language, custom, society system, art, physical and the most important thing is the Osing Traditional House. The shape of Osing traditional house is an example of Geometry visualization in community. One of Osing tradition is tumpeng sewu. Osing community also has traditional house that is still used by Osing community, especially in the Kemiren village.

3. Method

The aim of this research is to developing Geometry Learning by integrating GeoGebra based on Osing.

3.1. Participants

This research was conducted to thirty four students of 3rd semester of Mathematics Education Study Program at the Universitas of Jember in Bondowoso. This research was conducted in Geometry course, especially Geometry shape that is related with Osing culture.

3.2. Research phase

The research steps were designed into 3 phases to achieve the objectives as follows.

Phase 1: Literature review related research studies in order to develop teaching and learning method. The objective of this phase is creating a prototype method of teaching Geometry by using GeoGebra based on Osing culture and then use for discussion among experts in a focus group.

Phase 2: Developing teaching Geometry by using GeoGebra based on Osing culture under model

Phase 3: Evaluating teaching Geometry by using GeoGebra based on Osing culture to explore students' knowledge in solving problem.

3.3. Instruments

The instruments in this study were (1) lesson plan (2) observation sheets to observe the lecture's activities, and (3) students' questionnaire to ask the students' responses after applying the lesson plan. All three instruments were tested for validity before being used in this study. Content validation of lesson plan, observation sheets, and students' questionnaire were conducted by Mathematics education experts. All three research instruments were revised based on experts' advice.

3.4. Procedures and Data Analysis

This research was analysed and described qualitatively by describing the Geometry learning with Geogebra from Osing traditional house. There were four procedures employed to analyse the data in this study. First, analyse the result of validation based on Table 1 below.

Table 1. Validity level.

Score Va	Validity Level
$Va = 4$	More Valid
$3 \leq Va < 4$	Valid
$2 \leq Va < 3$	Less Valid

$1 \leq Va < 2$ Not Valid

The second analyse the result of observation sheet and the last is analyse the students' questionnaire. Then, the result of lecture observation sheet are analysed based on Table 2.

Table 2. Criteria of observation sheet compatibility and students' responses.

Score Na	Criteria
$Na = 4$	Very appropriate
$3 \leq Na < 4$	Appropriate
$2 \leq Na < 3$	Less appropriate
$1 \leq Na < 2$	Not appropriate

4. Result

This study begins by giving a problem about Osing traditional house. The students are asked to determine the minimum roof-tile for three different types of Osing traditional house. And then they have to finding the minimum roof-tile that could minimize the cost of roofing the house. Formerly, the researcher reminds the students about GeoGebra that has already learned by students. Afterward, the researcher facilitates students to discuss the axiom of rectangle surface area. The students need to prove the theorem about surface area of parallelogram and triangle by discussion with their group. The students also create a visualization of the theorem proving by using GeoGebra. Next, students are asked to solve the problem about roof-tile of Osing traditional house with their group as the project. The students are as well observed by the observers during the activities. The design instructional and students' projects are shown by the Figure 1 below.

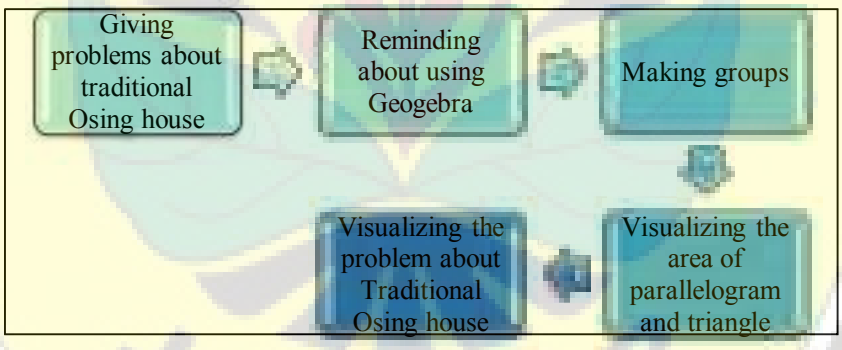

Figure 1. Diagram of Design Instructional.

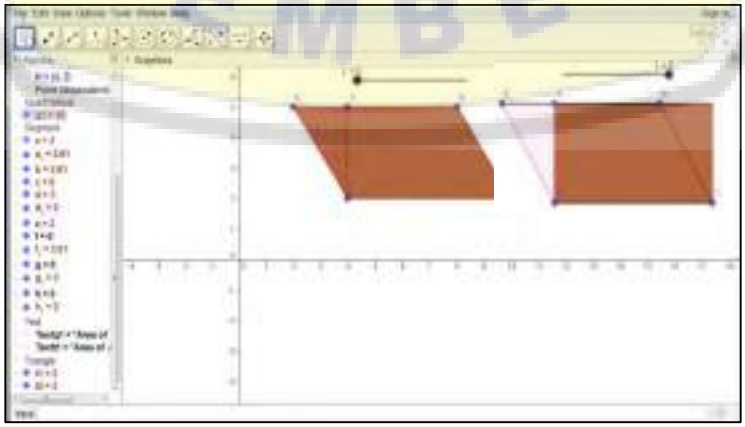

Figure 2. Proving Parallelogram Area by Using GeoGebra.

Figure 2 shows that one of the students' projects to visualize the theorem proof of the area of parallelogram. The first figure is parallelogram *EBDC*. Then students use slider tool to drag the pink triangle to the right side of parallelogram as figure beside the first figure. The figure becomes rectangle that has same area with parallelogram. So, the area of parallelogram is equal to base multiply by height. Figure shows the students' projects in visualizing the Geometry problems about roofing Osing traditional house.

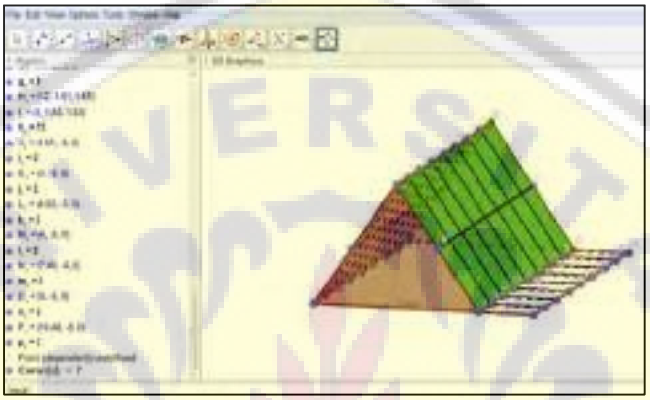

Figure 3. Modelling of Cerocogan Roof House by Using GeoGebra.

Figure 3 shows one of the students' projects in visualizing the problems. The figure is visualization of one Osing traditional house that is called Cerocogan. This house only has one side of roof, different from Tikel Balung that has two sides of roof. Students are asked to find the minimum cost to roofing the Osing traditional house. By this visualization, students could find the sum of roof-tiles to cover the roof. Then, students calculate the cost to roofing the house.

The improvement of most students was increasing, with respect to demonstrative and objective questions. Students' Geometry conceptual progress through tasks and a remarkable pedagogical organization was observed. Students and their group felt excited to prove the theorem and solve problems by using Geogebra. They could prove theorem with informal prove and visualization by using GeoGebra. The students felt satisfied when they could visualize Geometry shape related to proving theorem and solving problems.

As the result, the students understand more about Geometry shape concept and its application. Moreover, the researcher also analyse the questionnaire that has already fill up by students. The questionnaire items were modified from the item questionnaire [10]. The result of questionnaire is shown on the Table 3.

Table 3. Result of students' questionnaire.

No.	Statement	Y	N
1.	I was excited about using GeoGebra software	28 (82%)	6 (18%)
2.	I learnt a lot using GeoGebra	30 (88%)	4 (12%)
3.	I understood concept of Geometry shape more by using GeoGebra	31 (91%)	3 (9%)
4.	I was able to visualize the theorems proving and problems	27 (79%)	7 (21%)
5.	I was able to visualize the problems	25 (74%)	9 (26%)
6.	I could explore my knowledge about Geometry concept	27 (79%)	7 (21%)
7.	I enjoyed learning mathematics much more using GeoGebra	30 (88%)	4 (12%)

Results of Table 1 show that students generally gave positive feedback toward the GeoGebra software in Geometry learning. The majority of students, about 88% of them mentioned that they could understand Geometry two dimensional concepts by using Geogebra. So that 79% students could explore their knowledge about it. The positive responses is supported students' statement that they were excited about using GeoGebra software so that they learnt a lot using GeoGebra, About 79% of students said that they were able to visualize the Geometry objects related to proving theorem though only 75% students could visualize the Geometry objects related to Osing traditional house problems. They also enjoyed learning Mathematics much more when using GeoGebra.

5. Conclusion and Suggestion.

Osing ways in structuring their house can help some mathematics education students at University of Jember to do a better way in making sense of two dimensional shapes concepts. Learning method of Geometry shape by using GeoGebra has already created a culture based learning system that can help the students challenge themselves. After doing some research phases, a positive response related to the use of GeoGebra is achieved and the use of GeoGebra during their geometry lesson can help in setting up effective geometry learning. While applied GeoGebra gives good results, it is recommended as an alternative media to facilitate students in teaching and learning Geometry in order to increase effective teaching methods and learning process. Further research about culture based learning system especially Osing by using Geogebra could be conducted by another researchers.

Acknowledments

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