

Chapter 1 Introduction

1-1 Background and Motivation

Mathematics is the essence of fundamental science for people that is useful for daily life, especially knowledge of mathematics in the field of geometry. Geometry is a science that was found in nature about the authentically measurement of the earth and can be found in objects around us (Patkin & Levenberg, 2012). Learning of geometry begins when youth to adult with different levels of complexity that capacity for understanding, distinguishing to make geometry that can be useful to be applied to everyday life as well as in the future if it has work in an engineering environment (Common Core Standards Writing Team, 2013). Understanding of geometry and measurement on geometry objects especially in the concept of angle during the learning process can develop an important arithmetic understanding for students (Cross, Taniesha, Woods, & Schweingruber, 2009), but for the student in elementary school, the challenge is that representation of angles is difficult to understand and there is no link between the concept of angle and the experience of students with the geometric object on authentic (Leone, 2009) and the students become less understanding to solve simple problems because the student does not understand the concept from the beginning, which makes many students feel difficult to solve problems in geometry (Hillman, 2003). This condition is getting worse after the teacher only use paper-based that the images content not relevant to authentic objects (Hidayah, Dwijanto, & Istiandaru, 2018). Even though at the level Hiele's theory explained that students' skills for recognition the estimation in geometry were very important based on the example of the authentic object (Marchis, 2012) because many objects on mathematical learning only show the geometry material in the abstract on paper (Patkin & Levenberg, 2012) and students are feel difficult to understand about learning geometry (Ojose, 2008).

Geometry learning activities also can make a connection between 'understanding of computational estimation and students' understanding of measurement (NCTM, 2000) because students in elementary school must be able to do measurement and computing quantity estimation ability skills. Though doing estimation is difficult to make students become understanding (McIntosh, Alistair, Reys, & Reys, 1997) because estimating is a complex process but the important thing for mathematical competencies so students have the ability to feel and decision making to identify mathematical concepts on authentically. In addition, the ease of students to record using annotations is important to help students understand the learning process (Hwang, Chen, & Shadiev, 2011). The teacher has a

responsibility in providing correct understanding so students can understand the concepts of geometry and measurement independently, but the role of the teacher is also important to see the quality of student understanding through assessment (Browning, Edson, Kimani, & Tutak, 2014). In addition, the assessment was also carried out by the students themselves and with peer regulation to improve the quality of learning assessment (Laveault & Allal, 2016).

The development of augmented reality (AR) technology is new hope for authentic learning, especially for learning geometry so students can learn directly in the real world (Greg & Rampolla, 2012). However, the lack of studies that apply augmented reality technology to study geometry and also measurement in correctly, is a challenge for the researcher to make innovate to make it easier for students to learn to understand the concepts of geometry and measurement on authentic learning because AR technology has a variety of challenges in the developing process (Wu, Lee, Chang, & Liang, 2013). In this study, we built a tool to facilitate learn concept of angle in geometry object for elementary school students by implementing Augmented Reality (AR) technology with more high accuracy in authentic environments with the name Authentic-UG so students can be productive to learning independently and become meaningful learning. We also conducted an investigation after implementing Authentic-UG about the perceptions of students towards the use of the media during the learning process of the angle concept in order to increase the development of the design features of Authentic-UG for the future.

1-2 Purpose

The main objective of this study is to investigate the relationship between learning behavior using Authentic-UG based on augmented reality technology and learning achievement in elementary school students to learn concept of angles on geometry learning. Here are some research questions to answer this study:

1. What are differences between group using conventional method and group using Authentic-UG on learning achievement?
2. What are the relationships among learning behavior variables such as quantity & quality of measurements, learning assessment to learning achievement?
3. How are students' perceptions when learning geometry using Authentic-UG on authentic learning?