

# Developing Instructional Media Using Augmented Reality based on STEM in Malaysia and Indonesia

by Heri Retnawati, Wahyu Setyaningrum, Marsigit, Muh. Fendrik, Muh. Ikhsan

## ABSTRACT

Education is changing to a more modern direction along with the development of science and technology. This needs to be followed by improving the quality of learning technology used in the education process. The 21st century skills that need to be trained in students, namely the mastery of information technology and critical thinking skills that contain high-level thinking skills, it is necessary to develop teaching materials that practice Higher Order Thinking Skills (HOTS) in a framework of Science, Technology, and Mathematics (STEM) based on Augmented Reality (AR), which allows students to study anywhere, not limited by space and time. The results of research on augmented reality show that this learning technology is an effective basis for implementing learning in the technology era, but AR-based teaching materials for mathematics subjects are not yet available. In regards to this, there is a need for a media of learning mathematics with AR-based STEM framework to improve HOTS in learning mathematics.

To achieve this target, this research uses a research and development approach (research and development) using the Plomp model, which consists of three phases followed by socialization and dissemination. Phase I (2019) is a preliminary study to identify mathematical learning problems that train HOTS by utilizing technology and conducting need assessments to capture the characteristics of the devices needed by educators to carry out mathematics learning with AR-based STEM frameworks and develop AR-based media. Phase II (2020) is an AR-based media testing phase. In this phase II, after the device model is developed, an assessment phase is then carried out, by implementing a learning device model which is followed by dissemination and socialization. Data in phase I was collected through focus group discussions (FGD), and product validation questionnaires. Data analysis was performed descriptively qualitative.

The data obtained in the first year shows that teachers are still having trouble designing media to train HOTS and STEM integration, they also do not use much AR-based media. However, they are very enthusiastic to use AR to support mathematics learning. From the results of the FGD with the teacher, spatial geometry materials that were considered difficult for students were cube and beam webs and cones. Therefore, the first year of this study developed the media "*Kerucut AR*" which is an android application and Student Activity Sheet (Lembar Kegiatan Peserta Didik/LKPD) for class IX students of junior high school. The media have been validated by media and content experts with media and content validity scores 4.23 and 4.41 respectively from the maximum score of 5. This indicates that the media developed is valid.

Kata Kunci: *Instructional media, Augmented Reality, STEM*