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Training on Making 3D Models of Augmented Reality Based Hydrology Education Tools for Teachers

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Abstract

Augmented reality is frequently used as an additional medium in classroom teaching to make interactions between teachers and students in Indonesia more dynamic. By utilizing augmented reality display tools that have been developed, students can learn independently without the need for continuous guidance. However, challenges in developing augmented reality applications remain, resulting in a limited number of teachers who can create technology-based applications. To address this issue, a community service program was organized, consisting of a training workshop on creating 3D models based on augmented reality, attended by 15 teachers from various schools in Palopo. The training was divided into three sessions: the first session was a lecture, the second session was a guided tutorial, and the third session involved hands-on practice. The outcome of this training was that teachers were able to independently develop augmented reality applications and create augmented reality-based hydrology display tools that can be used to enrich classroom learning.

Keywords: *Community Service, Augmented Reality, Hydrology*

Introduction

Augmented reality technology is an innovation that can create digital illusions where 3D objects appear as if they exist in the real world and interact with the physical environment (Azuma, 2017; Moore et al, 2020). The presence of digital objects in this real-world context facilitates the learning process by allowing students to directly interact with, observe, and experiment with these objects (Hardianto et al, 2020; Zamzuri et al, 2020). This has a positive impact on developing deep student understanding of information management (Wójcik, 106; Vaughan et al, 2017). However, creating augmented reality-based learning products remains a significant challenge, especially for teachers, because this technology is still relatively new and not many developers have mastered it. Despite this, there are many benefits that can be gained from this technology, such as augmented reality display tools for introducing the solar system, hydrology learning tools, and various other educational tools that teachers can develop based on the subjects they teach (Arifitama, 2015; Syahputra et al, 2018).

With the initiative of the Association of School Supervisors of Indonesia (APSI), a training workshop on creating augmented reality was organized for teacher representatives from all over Palopo. This training is part of the duties and responsibilities of lecturers as a form of community service in the field of education and

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research (Zhou et al, 2019; Høyer et al, 2017). Fifteen teachers with diverse backgrounds participated in this training to gain knowledge about augmented reality and how to create augmented reality applications. The hydrological process was chosen as a demonstration application example, as well as an illustration of the application of augmented reality technology in science lessons to be used in schools (Sanchez et al, 2016).

Method

The community service carried out included the use of lecture, practical, and evaluation methods tailored to the needs of the training participants, with the goal of ensuring that participants could understand and independently develop augmented reality applications. The lecture method was used as an initial approach to deliver teaching materials to the training participants (Oswald et al, 2019; Li et al, 2022). Essentially, the lecture method is only used to introduce the training activities and explain the basic material to participants who are new to the topic or theme of augmented reality. The material delivered through the lecture method includes: (1) General introduction to Augmented Reality; (2) History of Augmented Reality Development; (3) Potential Development of Augmented Reality as a Teaching Tool (Bernardes et al, 2018; Wibowo et al, 2022).

However, the lecture method becomes less effective when used continuously throughout a training session. This is due to the potential for the learning process to become monotonous, especially if participants are not given the opportunity to understand concepts independently and actively. In such conditions, participants tend to only engage in note-taking without truly absorbing the material presented. The density of the material can also hinder their understanding of the content. To address this issue and ensure that participants can effectively master the necessary technical skills, it is important to integrate other, more interactive and practical methods. One recommended approach is the step-by-step practical method, which allows participants to directly apply the concepts learned in real-world situations and receive constructive feedback (Opriş et al, 2018). With this method, it is expected that participants will be more active, engaged, and better able to understand and master the technical skills being taught.

The practical method is a learning process in which participants learn through direct experience, following procedures, observing objects, analyzing, proving, and drawing conclusions about the objects (Woods et al, 2016; Pratiwi et al, 2013).

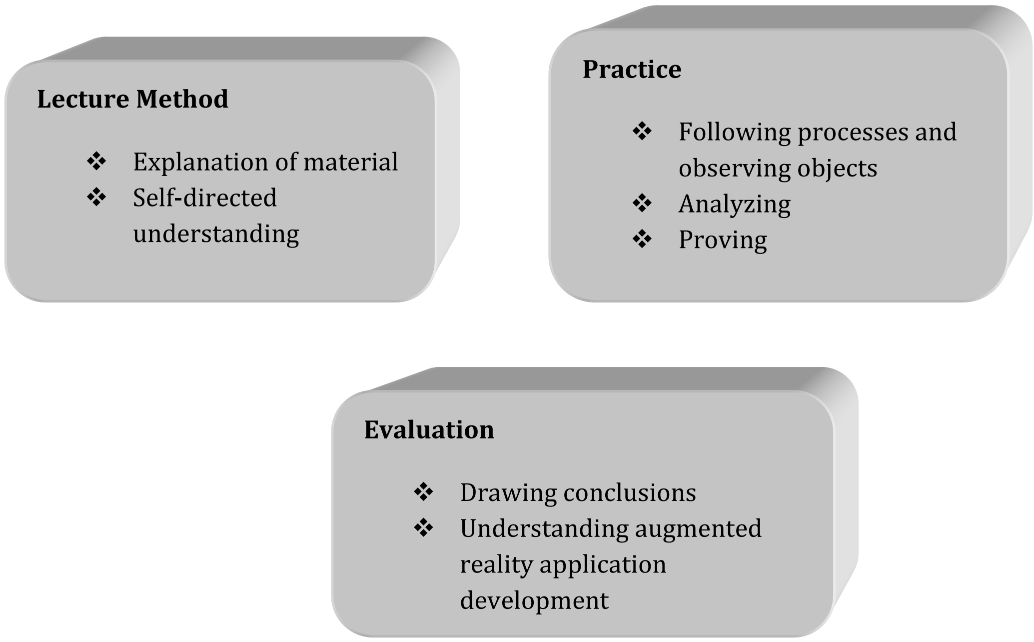

Figure 1. Method Practice

The material organized for the practical implementation includes (Chou et al, 2018): (1) Introduction to Unity as a development platform; (2) Introduction to Vuforia SDK as an augmented reality SDK; (3) Introduction to basic Unity application tools; (4) Creating scenes in Unity; (5) How to change materials in Unity; (6) Working with canvas in Unity; (7) Creating markers in Vuforia; (8) Unity settings for augmented reality applications; (9) Creating a Hydrology Demonstration tool (Afrozz et al, 2018; Leinonen et al, 2021; Wolf et al, 2021). The final method applied in this training is evaluation, which is crucial for ensuring that participants can understand and execute the instructions provided during the practical sessions. This evaluation is essential as feedback from participants to the training organizers.

Results and Discussion

The community service, conducted in the form of a one-day training, was carried out by a lecturer from the Informatics Engineering Study Program, in accordance with the invitation received from the organizers. The purpose of this activity was to provide additional knowledge and skills to the selected participants. The training began with a lecture by a speaker who is an expert in the field, providing an introduction and foundational material for the topics to be covered. This lecture, as shown in Figure 2, marked the initial stage of the entire training sequence designed to equip participants with relevant and practical information. Following the lecture, participants engaged in various interactive and practical activities to deepen their understanding of the material presented.

Figure 2. Talks at Sessions Opener

In Figure 2, it is clear that the speaker is delivering a lecture to the training participants. This lecture focuses on a general explanation of augmented reality technology, which is the main topic of the session. Augmented reality technology has been available in Indonesia since early 2012. Since then, it has offered various innovations that are highly useful in the field of education. One of its main benefits is its ability to provide visualizations of objects or props used in the learning process, thereby facilitating students' understanding of the material.

The ongoing training is designed to equip participants with fundamental skills in creating augmented reality applications. The goal of this training is for participants to apply these skills in a classroom teaching context, thereby enriching existing teaching methods. As part of this training, after the lecture session is completed, participants will proceed to a practical session. Figure 3 shows the practical activities that are the next step after the lecture, where participants will have the opportunity to practice what they have learned.

Figure 3. Implementation Practice

Figure 3 represents an image of the implementation process practicum, where the source person demonstrates stages from making an augmented reality object. In session This augmented reality explanation is done with a method gradually about making application hydrology based on augmented reality (Takahashi et al, 2017; Griffiths et al, 2019).

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Figure 4. City Landscape Making

Once the practical activities are completed, the activity is considered finished (Zhang, 2019). This is part of the evaluation process for participants, where the activity evaluation is conducted (Wang et al., 2018; Kulikajevas et al., 2019). The evaluation involves assessing whether participants can follow all instructions during the training, and the results show that all participants successfully created augmented reality applications. In Indonesia, augmented reality is increasingly used as a teaching aid in classrooms, making learning more interactive between teachers and students. Students can engage in self-directed learning using tools equipped with augmented reality displays without requiring additional guidance. However, the development of augmented reality applications still faces challenges, and as a result, not many teachers are able to develop augmented reality-based applications. Therefore, community service activities have been conducted in the form of training on creating 3D models based on augmented reality.

Conclusion

The training is divided into three main sessions: the first session uses a lecture method, the second session employs guided tutorial methods, and the third session involves hands-on practice. Through this training, teachers successfully gained skills to independently create augmented reality applications and develop augmented reality-based hydrology props that can enhance classroom learning experiences. The community service activity, themed around training in creating augmented reality-based teaching tools, has been successfully executed. All participants were able to build augmented reality-based applications with the help of the trainers. The results of this community service are expected to provide additional benefits to teachers as a reference and resource in their teaching process.

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