

AR Module: Is It Necessary to Improve Students' Environmental Care Character?

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Abstract—Character building has become one of the main focuses in realizing Golden Indonesia Generation of 2045 and it is done through the education process in school. Teachers need the media to facilitate the goal by combining learning and technology. The technology that can be used is Augmented Reality (AR). AR is currently developed for games and other businesses. This research is to reveal the need for augmented reality module to improve students' environmental care character. This study employed a survey through observation, interviews, and questionnaire for teachers and students. This research was conducted in the fourth-grade students of Galur district by involving the research subject of 30 teachers and 150 students in SD Negeri Sungapan I, SD Negeri Prembulan and SD Negeri Brosot. The results of this study indicated that teachers need the media or other teaching materials that support learning activities. The AR-assisted modules were considered necessary as a supplemented media for the teachers and the students' books.

Keywords—environmental caring, character, augmented reality, module.

I. INTRODUCTION

Character issues have been the main focus of the Indonesian government today. The number of cases like murder, fights, theft, garbage, and illegal logging, make character education very important to be put forward. The Indonesian government has a golden mega-project that will be realized in 2045. Therefore, education plays an important role to realize it. As stated by Rokhman et al., the correlation coefficient of education to the human resource development index was 0.99 that means education has a big contribution to the rise of the prosperity index [19]. Thus, the Indonesian government should be able to maximize the moment to have great human resources by 2045.

One of the main characters that need to be improved is the caring character of society. This is because many Indonesian people do not really care to maintain the surrounding environment, for example, many people throw garbage carelessly and the lack of waste treatment systems and non-organic waste recycling systems make it worse. Indonesia ranks

second in the world for the biggest plastic waste producers to the sea after China [10,17]. The plastic waste from 100 Indonesian Retail Merchants Association of shops or stores for one year is 10.95 million pieces of plastic bag waste which equal to the area of 65.7 ha plastic bags or about 60 times the size of the football field. On the other hand, illegal logging is also the focus of the Indonesian government, such as illegal logging in the carbon-rich province of Aceh and Sumatra. Moreover, from 2008 to 2009, Fauna & Flora International established and supported a community-based informant network for the 738,000 ha Ulu Masen ecosystem and this network reported 190 illegal logging suspects. From 45 cases subsequently monitored, 64.4% proceeded to court, from which 90.0% of defendants received jail sentence or verbal warning for a first offense. Spatial analyses of illegal logging and timber storage incidents predicted that illegal activities would be more effectively deterred by law enforcement operations that targeted the storage sites. Although numerous clusters of incidents were identified, they were still widespread reflecting the ubiquity of illegal activities [15]. Therefore, the development of environmental cares becomes one of the important things.

The environmental care character needs to be grown from an early age. It can be done through simple activities, such as training the child to put waste in its place, emphasizing the responsibility towards the surrounding environment and underlining the use of natural resources wisely. Habituation is expected to be embedded in the child mind and attitude until they get mature. The content has been actually inserted in the learning book of the 2013 curriculum, but the existing content needs to be implemented in the students' daily life.

This environmental issue has become a concern of the government. The Ministry of Environment and Forestry in 2013 developed the Environmental Care Behavior Index as a measurement tool to identify human behavior in relation to the environment. The survey reported that the index of environmental care needs to be developed. Some of the less

environmentally conscious in the report included no energy-saving lamps (15.5%), day lamps (24.1%), garbage disposal (76.1%), garbage burning (38.2%), the waste of rivers, ponds, swamps, sea (15.8%), and lack of waste channel (75.7%).

The survey shows that the urgency of character education to promote the students' character development in schools and other youth community [4]. The characters also cannot be simply formed because it should be through a continuous process or habituation. The Character is composed of three interrelated parts, namely moral knowing, moral feeling and moral behavior [14]. Good character consists of knowledge, desire, and action. Forester adds that character is something that can qualify a person, and it becomes an identity to overcome the changing of contingent experience [1].

The environmental care character is one of the 18 characters values emphasized by the Indonesian government. People that have a caring character towards the environment always strive to realize harmony, and balance between self and the environment. They will also preserve the environment and utilize natural resources wisely. It is supported by Asmani who states that the value of environmental-care characters refers to the attitude and actions that always try to prevent environmental damage and to fix the existing destruction [3].

The development of environmental care character can be realized if it is nurtured as early as possible and the primary school age is a suitable period for it. Piaget & Inhelder states that according to its development, students at the age of 7 to 11 years are in the concrete operational stage in which point their thinking ability has begun to be fully structured. At this stage, students behavior can also be formed by inviting them to think about the consequences of environmental damage [18]. Slavin adds students at this concrete operational stage forming concepts, seeing relationships, and solving problems. In this case, the development of students' thinking ability at the concrete operational stage has developed, but it is limited based on their experience [21].

The efforts to improve the character of the environment care can be done in various ways. For example, the research conducted by Handayani and Sopandi indicates that the class that uses PBL showing a high level of environmental concern and they become more successfully recognize statements, images, and sentence combinations as well as pictures that express a caring attitude to the environment [9]. In addition, Saputra and Faizah find that teaching materials about the environment can facilitate the students' understanding, increase learning independence, facilitate students, interests, and improve students' involvement in the learning process [20].

Another effort that can be done is by utilizing the existing technology, such as augmented reality technology. It is a technology that can help people to get information through mixing virtual data and the real world [5, 8, 11, 22]. This augmented reality technology will be combined with printed materials in the form of modules. This combination is expected to assist students to easily understand the material. The module according to MoNE is a set of teaching materials that are systematically presented to be learned with or without a facilitator or teacher. So, students can learn independently.

II. RELATED WORKS

Fenty et al. (2015) on their research entitled "The Implementation of Augmented Reality in the Development of Interactive Learning Media Photosynthesis Material for 5th Grade Students of SD Budi Luhur Pondok Aren" uses IMSDD (Interactive multimedia system design and development) employees four stages, namely (1) system requirement, by collecting the needs of the system; (2) design consideration, by creating an interactive design of the Plant AR application; (3) implementation, by creating an interactive interface using Adobe Flash CS3 and Augmented Reality creation with 3DMax software and Openspace3D stage editor; (4) evaluation, in terms of aspects of human and computer interaction, software quality and learning benefits aspects. Based on the evaluation results, this learning application can assist students in obtaining visualization of photosynthesis process with new and interesting experiences, and make the learning more interesting [11]. This research is relevant to this research because it also aims to visualize learning so that the students can easily understand the material contents. However, the difference is the use of the "unity" application, not Adobe Flash CS3.

Moreover, Chen et al. (2016) in his research entitled "An augmented-reality-based concept map to support mobile learning for science" shows that the students who use CMAR are more confident about their self-learning. This reveals that the CMAR system enables the students to comprehend the learning goals. Moreover, the questionnaires indicate that students respond positively to the CMAR system. The interview results also present the students believe that the CMAR system helps them to organize course content and clarify the presented material. Therefore, the students expect to learn with CMAR system [6]. It means that augmented reality is effective to increase the students' confidence in learning.

III. METHODOLOGY

A. Data

The techniques of data collection were interview, observation, questionnaire, and literature study. The type of interview in this study was a semi-structured

interview. The observation was done directly to the object being study. The questionnaire analysis of development needs of Augmented Reality-assisted module distributed to the teachers and the students. The collected data were analyzed and conclusions were drawn. The data analysis was done by using a statistical description of which the obtained data was in the form of quantitative (percentage) and it was explained qualitatively. The research subjects were 30 teachers and 150 students of the fourth elementary school in Kulonprogo, Yogyakarta.

B. Method

The research was conducted using a survey method. This research did not provide any treatment to the respondents. It was only collecting data using standardized instruments. The stages of this research began with the determination of the problem. The problem raised in this study was the needs of the students and the teachers for media learning in order to improve the students' environmental care character. The survey was to obtain the primary data in the location and time that had been determined. After that, the data analysis was done, and the conclusions were drawn from the whole process.

IV. RESULTS AND DISCUSSION

A. Results

Based on the observations from SDN Sungapan I, SDN Prembulan and SDN Brosot in August 2017, the learning was conducted using the 2013 Curriculum. The teachers' understanding about the 2013 Curriculum was also adequate. They already knew the purpose of the 2013 curriculum development, i.e. to improve the cognitive, affective and psychomotor ability of children. However, in the implementation, the teachers experienced several constraints such as the availability of media to support the learning implementation. Besides, it was found that the students' care character was low. It can be seen from the way the students who throw garbage carelessly and waste the water.

TABLE I. OBSERVATIONS RESULT

School	Observation Period	Information
SDN Sungapan I	1 to 10 August 2017	All teachers had implemented the 2013 Curriculum well
SDN Prembulan	11 to 19 August 2017	All teachers had implemented the Curriculum 2013 well
SDN Brosot	21 to 28 August 2017	There were 2 teachers who look confused in implementing the 2013 Curriculum

The interviews result among the fourth-grade teachers and students of the elementary school on August 30, 2017, showed that the teachers needed media that can help the students to learn thematic subjects easily, especially for math and science course. In addition, most students had a visual learning style but there were no media that can facilitate students to improve the students' character. It was also found that the students' reading interest low since they only read books in school. They mostly spent their time at home to play and watch TV. In addition, according to the teacher, the students should be improved their care attitude to the surrounding environment because there were many students who were littering the garbage.

Furthermore, the students were given the questionnaire to know the students' needs. The first response was to see their enthusiasm to use thematic textbooks of the 2013 Curriculum as the only learning source. The question was "Do you feel happy if the learning only uses textbooks provided by the government?" The results of the question are as follows.

TABLE II. QUESTIONNAIRE RESULT ON STUDENT NEED

Subject	Category	n
Student	Very boring	32
	Boring	91
	Fun	27
	Very fun	0
Average answers	Boring	Σ=150

The table shows that 32 students felt very bored, 91 students were bored, 27 students were happy and no students were very happy. Furthermore, the second question was distributed to reveal the student's response if the existing learning was changed with an assisted module with an application through their Android phone. The data obtained are as follows.

TABLE III. RESULTS OF STUDENTS' NEEDS ON AR-MODULE USE

Subject	Category	n
Student	Strongly disagree	0
	Disagree	0
	Agree	94
	Strongly agree	56
Average answers	Agree	Σ=150

The table shows that most students agreed with the use of the application, 94 students agreed and 56 students strongly agreed. Furthermore, The data are presented in graphical form in Figure 1.

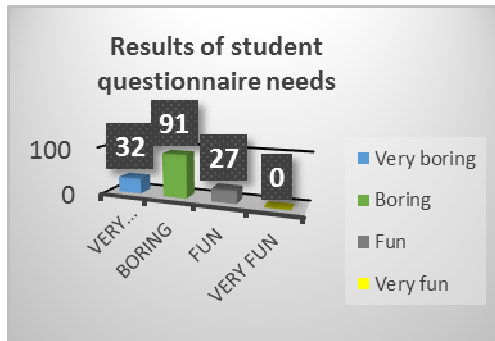


Fig. 1. The student responses to textbooks

Based on the triangulation sources from observations, interviews, and questionnaires, it can be concluded that students feel bored to learn only with textbooks, and they need learning media to facilitate their learning process. In addition, they agreed with the creation of modules that are assisted with an application in android phone.

B. Discussion

The observations results in August 2017 showed that the students' character on environmental care is still low. They still litter garbage and waste the water. The students' characters need to be developed as early as possible so that they can be attached until adults. This is in accordance with the Lickona's opinion that the characters are composed of three interrelated parts, namely moral knowing, moral feeling, and moral behavior. The first step is to instill moral knowledge to students through learning activities [13, 14]. Mustadi adds that character education in schools is a system of nurture character values to children including the components of knowledge, awareness or willingness, and actions to implement those values [16]. Therefore, character education is considered important in schools.

The teachers still have difficulties in designing media that can be used for learning. The difficulty is seen during the observation since they only use the learning books provided by the government without any variation or development. It makes learning not optimal. This problem is in line with Prastowo's opinion that the quality of learning becomes low when teachers just employ conventional teaching materials without any creativity to develop innovative material [2].

The interview results among the teacher and the students of the fourth-grade elementary school indicated that the teachers need the media to help students to learn the thematic subjects easily, especially for math and science. In addition, most students have a visual learning style but there are no media that can facilitate them to improve their character. The results of the students' response from the questionnaire also indicate that they feel bored if the learning only uses one source of textbooks.

Learning media is considered very important to help them to have effective learning. The role of the media in accordance with the opinion of Levie & Lentz where the media is to attract and direct the attention of students to concentrate on the learning content [12].

Basically, as a teacher, the use of media is a crucial component of learning. This is in accordance with the opinion of Fathurrohman and Sutikno who state that the use of instructional media is part of the overall teaching situation [10].

The learning can also be varied with the use of other teaching materials, such as a module. The module is considered as a complete teaching material because it contains materials and exercise to deepen the students' knowledge. It is in accordance with the Chomsin and Jasmadi idea which explains that a module is a learning tool that contains systematic material, methods, limitations, and evaluation. It is designed attractively to achieve the expected competence based on the complexity level [6].

The modules of this study are created with Augmented Reality (AR) technology. This research uses AR because this technology aims to help people to obtain information by mixing virtual data and the real world. It can also involve the five senses of the human to improve the perception and interaction of the users with their real world. Thus, students can have a better learning experience. The AR has been implemented by Saputro & Saputra [20] in the study entitled "Development of Learning Media Knowing Human Digestive Organs Using Augmented Reality Technology" They shows that the application of Augmented Reality able to realize virtual world to the real world. It can also display the objects of 2D into a 3D object. Those trigger the students' curiosity about the digestive organs. This kind of research is very likely to be developed in a better direction, so that in the future. it can be applied to several necessary and suitable topics.

V. CONCLUSION

Based on the results and the discussion, it can be concluded that teachers need AR-assisted modules to improve students' character of environmental care. Through augmented reality aided module for the fourth-grade students of elementary school, it can be a solution in implementing the learning that facilitates the students to develop environmental care character. The teachers and students give good to respond to the AR-assisted modules.

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