



## Augmented Reality as Early Childhood Learning Media: Environment Theme

Oka Irmade<sup>1\*</sup>, Paulus Widjanarko<sup>1</sup>, Eka Titi Andaryani<sup>2</sup>

<sup>1</sup>Universitas Slamet Riyadi, Indonesia

<sup>2</sup>Universitas Negeri Semarang, Indonesia

DOI: <https://doi.org/10.15294/edukasi.v16i1.36655>

### Info Articles

#### *History Article*

Submitted 2021-02-27

Revised 2022-03-2

Accepted 2022-04-16

#### *Keywords:*

Augmented Reality; Early  
Childhood; Learning Media

### Abstract

Augmented Reality is a result of technological advances that can be used to improve learning outcomes. The purpose of this study is to provide an overview of the development of learning media based on Augmented Reality on the theme of my environment with the discussion of saving in the bank and buying and selling in the market which is applied to early childhood learning. The method used is Research and Development with the following stages: (1) preliminary investigation, (2) design, (3) realization/construction, (4) test, evaluation, and revision. Expert judgment is used in the development of this product, followed by trials with early childhood students to get various responses as input for improvement. The results of the assessment carried out by experts are included in the category of good scores and are suitable for use. The response from the students was positive, they preferred the material to be presented in 3D accompanied by an audio explanation.

\*Alamat Korespondensi:  
E-mail: [irmadeoka89@gmail.com](mailto:irmadeoka89@gmail.com)

p-ISSN 0852-0240  
e-ISSN 2746-4016

## INTRODUCTION

Technology that is developing rapidly has an impact on the development of education in Indonesia. Technological developments can help with learning limitations. This is marked by the use of modern technological devices or equipment to achieve effective and efficient learning both at the early childhood education level to higher education. Digitization of learning media is one form of adaptation carried out for new forms of learning (Sorko & Brunnhofer, 2019), which leads to the current generation of students known as generation Z. In early childhood education, the use of virtual-based learning media including virtual reality (VR) and augmented reality (AR) is an effort to digitize media to improve student learning processes which are expected to provide more stimulants. compared to conventional media in the 4.0 industrial revolution era (Masood & Egger, 2019).

Augmented reality is one of the uses of computer content technology that is raised in a real - world environment (Wang, Callaghan, Bernhardt, & White, 2017). AR is a virtual and physical container side by side, users learn while communicating with others in the same space (Martíngutiérrez, Fabiani, Benesova, Dolores, & Mora, 2015). AR technology refers to the inclusion of virtual elements in the view of the actual physical environment, to create mixed reality in real-time (Cai et al., 2019; Miguel, Ruiz-rube, & Manuel, 2018). AR can be applied to different devices such as smartphones, tablets, laptops, computers, or head-mounted monitors (Pedaste, Mitt, & Jürivete, 2020). AR provides the ability to overlay image, text, video, and audio components onto an existing image or space. Various benefits can be obtained through the use of augmented reality-based media such as increased learning motivation, attention, satisfaction (Khan, Johnston, & Ophoff, 2019; Lai, Chen, & Lee, 2019; Wahyu, Suastra, Sadia, & Suarni, 2020), to think critically (Chang & Hwang, 2018) and support students with learning difficulties (Turan & Atila, 2021). Through this AR-based learning media, students can experience learning independently with operations that can be done easily by themselves. The process of independent learning is seen as one of the main competencies for students (Qamata-mtshali & Bruce, 2018). But in reality, designing and developing AR learning media for early childhood is not easy, it is necessary to make various adjustments to the AR design with the right choice of topic or theme. Not all topics or themes are appropriate and effectively used by AR media as well as self-regulation abilities (Daumiller & Dresel, 2018).

For this reason, researchers will develop AR-based early childhood learning media as an alternative to improve the quality of learning by selecting the My Environment theme which is divided into cases of how to save in the animation presented, namely people who are carrying out transactions/saving at the bank and animation of buying and selling processes in the market. The specific purpose of this research is to find out how to design AR-based PAUD learning media as an effort to improve the early childhood learning process through the My Environment theme which is divided into two sub-themes.

## METHODS

The research method used is the research and development method or known as Research and Development (R&D). This method is used to produce certain products and tests the effectiveness of these products (Fransisca, Putri, & Kom, 2019). This development research method uses a model developed by Plomp which was adapted with several modifications using four main stages, namely (1) preliminary investigation, (2) design, (3) realization/construction, (4) test, evaluation, and revision. In general, it is described as follows:

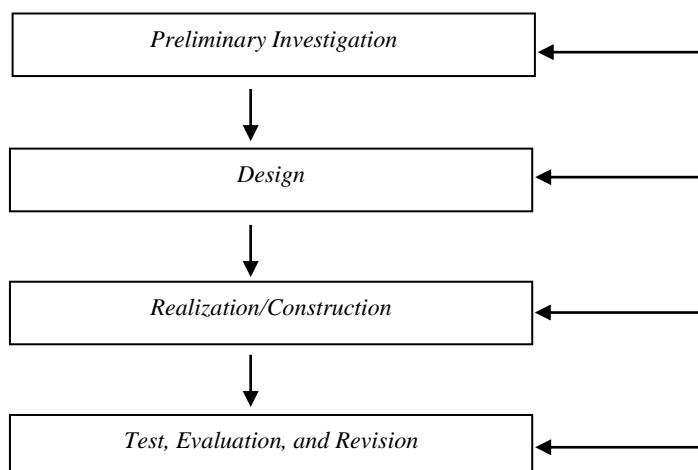


Figure 1. Plomp Development Stages (Arianatasari, 2015)

## RESULTS AND DISCUSSION

### Phase Preliminary Investigation

This initial investigation phase is a step to analyze the needs of various problems, potentials, and obstacles that arise in early childhood learning. Early childhood learning still encounters several problems and obstacles. Based on data mining from discussions and interviews with 30 teachers from various institutions in Surakarta, it was found that the reference books used were less attractive to students because they were only in the form of explanatory writing, this made students less enthusiastic about learning. Besides, teachers have not been able to develop interactive media that can be used efficiently for learning. This is due to several obstacles, namely time burdened with taking care of administration, and lack of information about current technological developments that can be used as learning media. Media that contains text to explain and pictures to provide examples make the learning process monotonous which causes students to become less enthusiastic about participating in learning. The development of AR-based media has various conveniences in the use of both teachers and students and is easy to apply in achieving the learning objectives to be achieved. The development of AR-based media as a learning resource is supported by various teacher suggestions about alternative learning resources that can be used as guides that look attractive and are by the learning scenario. To complete this phase, an investigation is also carried out to find an overview of the results of research publications on topics related to AR which can be described as follows:





Figure 2. Toik-topik berkaitan AR tahun 2016-2020 (Santosa, Hadi, Subiyantoro, Irmade, & Sukmawati, 2021)

**Phase Design**

Making AR-based media designs through discussions with several experts who will later decide how the product will look and with what application to make it. The Augmented Reality prototype was developed using Unity software based on the components in the storyboard design. Unity is used because it is cheaper (there is also a free version), it is fast development, supports the Ruby language, and allows writing complex transformations such as creating AR systems with many 3D assets resulting in interactive applications. (Nguyen & Dang, 2017; Sarosa, Chalim, Suhari, Sari, & Hakim, 2019).

**Phase Realization/Construction**

Augmented Reality media validation, is carried out by Educational Technology experts who are lecturers at the Surakarta campus. The assessment starts from the system quality factor with aspects of the assessment consisting of function, ease of access, interaction, ease of use, and interface display, while the service quality factor with aspects of availability when needed, personality, and response speed. The validation results from the experts are shown below:

Subject	Visual Display
Applications used for AR Development	
Preferred mode when opening the app	

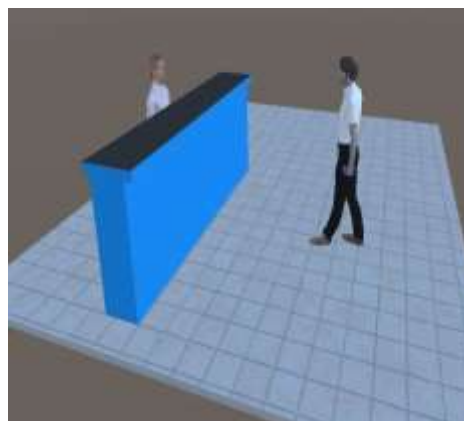
AR barcode to be scanned through the app



Result after barcode scan with Smartphone



Animation in BANK  
The process greeting



Animation in BANK  
The process of conversation in the process of saving money



Animation in Market  
The process goes to greet the seller



Animation in Market  
Bidding and payment process



Table 1. Media Expert Validation Results

Aspect	Skore (1-5)
Functionality	4
Accessibility	5
Ease of use	5
Interface view	4
Availability when needed	4
Response speed	5
Total	27

Conclusion: overall validation from media experts is included in the "Good" category with a score of 27

Table 2. Content Expert Validation Results

Aspect	Skore (1-5)
Material suitability	5
Concept truth	5
Accuracy of facts and data	5
Term accuracy	4
Concept Crash	4
Encourage curiosity	5
Total	28

Conclusion: overall validation from content experts is included in the "Good" category with a score of 28

### Phase Test, Evaluation, and Revision

In this phase, a trial of the product resulting from the realization phase is carried out, after the refinement of the expert revision has been completed. AR-based media testing was carried out through limited trials and field trials conducted on early childhood students. When AR-based media was given to students in a limited trial of three students, the results of observations showed that students felt enthusiastic and happy, they could access it via smartphones and could easily understand the animations and messages it conveyed. So from the element of student readability, AR-based media is included in the good category. Then based on the results of field trials conducted on 15 students, a score of 3.4 was obtained which could be interpreted as saying that the AR-based media was in a good category. The results of the question and answer also show that students prefer that the material is presented in 3D accompanied by an audio explanation. These results are similar to the opinion that Augmented Reality technology was introduced to make access to learning materials easier, as well as increasing the interaction between learning materials and students as well as supporting more effective teaching strategies. (Köse & Güner-yildiz, 2020; Radosavljevic, Radosavljevic, & Grgurovic, 2018) .

### CONCLUSION

The development of Augmented Reality-based learning media on the topic of saving in banks and buying and selling in the market is indeed feasible to use to improve student learning. Interest and enthusiasm for 3D media packaged in the use of mobile phones are very visible in early childhood students from the beginning to the end of learning. However, future research needs to consider relatively heterogeneous students for the application of field tests so that better results are obtained. It is also necessary to develop AR teaching materials made in other formats.

### REFERENCES

- Arianatasari, A. (2015). Penerapan Desain Model Plomp Pada Pengembangan Buku Teks Berbasis Guided Inquiry. *Jurnal Pendidikan Akuntansi*, 6(1), 36–40.
- Cai, S., Liu, E., Shen, Y., Liu, C., Li, S., & Shen, Y. (2019). Probability learning in mathematics using augmented reality : impact on student ' s learning gains and attitudes. *Interactive Learning Environments*, 0(0), 1–14. <https://doi.org/10.1080/10494820.2019.1696839>
- Chang, S., & Hwang, G. (2018). Impacts of an augmented reality-based flipped learning guiding approach on students' scientific project performance and perceptions. *Computers & Education*. <https://doi.org/10.1016/j.compedu.2018.06.007>
- Daumiller, M., & Dresel, M. (2018). Supporting Self-Regulated Learning With Digital Media Using Motivational Regulation and Metacognitive Prompts. *The Journal of Experimental Education*, 0(0), 1–16. <https://doi.org/10.1080/00220973.2018.1448744>
- Fransisca, S., Putri, R. N., & Kom, M. (2019). PEMANFAATAN TEKNOLOGI RFID UNTUK PENGELOLAAN INVENTARIS SEKOLAH DENGAN METODE ( R & D ) ( Studi Kasus : SMK Global Pekanbaru ). *Jurnal Mahasiswa Aplikasi Teknologi Komputer Dan Informasi*, 1(1).
- Khan, T., Johnston, K., & Ophoff, J. (2019). The Impact of an Augmented Reality Application on Learning Motivation of Students. *Journal Advances in Human-Computer Interaction*. <https://doi.org/10.1155/2019/7208494>
- Köse, H., & Güner-yildiz, N. (2020). Augmented reality ( AR ) as a learning material in special needs education. *Education and Information Technologies*, (39). <https://doi.org/https://doi.org/10.1007/s10639-020-10326-w>
- Lai, A., Chen, C., & Lee, G. (2019). An Augmented Reality-based learning approach to enhancing students' science reading performances from the perspective of the cognitive load theory. *British Journal of Educational Technology*, 50(1), 232–247. <https://doi.org/10.1111/bjet.12716>

- Martín-gutiérrez, J., Fabiani, P., Benesova, W., Dolores, M., & Mora, C. E. (2015). Augmented reality to promote collaborative and autonomous learning in higher education. *Computers in Human Behavior*, *51*, 752–761. <https://doi.org/10.1016/j.chb.2014.11.093>
- Masood, T., & Egger, J. (2019). Augmented reality in support of Industry 4.0 — Implementation challenges and success factors. *Robotics and Computer Integrated Manufacturing*, *58*(August 2018), 181–195. <https://doi.org/10.1016/j.rcim.2019.02.003>
- Miguel, J., Ruiz-rube, I., & Manuel, J. (2018). Augmented reality mobile app development for all. *Computers and Electrical Engineering*, *65*, 250–260. <https://doi.org/10.1016/j.compeleceng.2017.08.025>
- Nguyen, V. T., & Dang, T. (2017). Setting up virtual reality and augmented reality learning environment in Unity. In *IEEE International Symposium on Mixed and Augmented Reality Adjunct Proceedings*. <https://doi.org/10.1109/ISMAR-Adjunct.2017.97>
- Pedaste, M., Mitt, G., & Jürivete, T. (2020). What Is the Effect of Using Mobile Augmented. *Education Science*. <https://doi.org/10.3390/educsci10040094>
- Qamata-mtshali, N., & Bruce, J. C. (2018). Self-directed Learning Readiness Is Independent of Teaching and Learning Approach in Undergraduate Nursing Education. *Nurse Educator*, *43*(5), 277–281. <https://doi.org/10.1097/nne.0000000000000493>
- Radosavljevic, S., Radosavljevic, V., & Grgurovic, B. (2018). The potential of implementing augmented reality into vocational higher education through mobile learning. *Interactive Learning Environments*, *0*(0), 1–15. <https://doi.org/10.1080/10494820.2018.1528286>
- Santosa, E. B., Hadi, B., Subiyantoro, S., Irmade, O., & Sukmawati, F. (2021). Augmented Reality for Student Learning Media : A Bibliometric Analysis and Visualization. *Indonesian Journal of Instructional Media and Model*, *3*(2), 47–55. <https://doi.org/http://dx.doi.org/10.32585/ijimm.v3i2.2007>
- Sarosa, M., Chalim, A., Suhari, S., Sari, Z., & Hakim, H. B. (2019). Developing augmented reality based application for character education using unity with Vuforia SDK. *Journal of Physics : Conference Series*. <https://doi.org/10.1088/1742-6596/1375/1/012035>
- Sorko, S. R., & Brunnhofer, M. (2019). Potentials of Augmented Reality in Training. *Procedia Manufacturing*, *31*, 85–90. <https://doi.org/10.1016/j.promfg.2019.03.014>
- Turan, Z., & Atila, G. (2021). Augmented reality technology in science education for students with specific learning difficulties : its effect on students ' learning and views. *Research in Science & Technological Education*, *00*(00), 1–19. <https://doi.org/10.1080/02635143.2021.1901682>
- Wahyu, Y., Suastra, I. wayan, Sadia, I. wayan, & Suarni, N. K. (2020). The Effectiveness of Mobile Augmented Reality Assisted STEM-Based Learning on Scientific Literacy and Students ' Achievement. *International Journal of Instruction*, *13*(3), 343–356. <https://doi.org/https://doi.org/10.29333/iji.2020.13324a>
- Wang, M., Callaghan, V., Bernhardt, J., & White, K. (2017). Augmented reality in education and training : pedagogical approaches and illustrative case studies. *Journal of Ambient Intelligence and Humanized Computing*, *0*(0), 0. <https://doi.org/10.1007/s12652-017-0547-8>