International Journal of Research and Applied Technology

2(2)(2022) 198-203
Journal homepage: https://ojs.unikom.ac.id/index.php/injuratech

# A Smart Picture Book Design Using Augmented Reality Technology

**Suryatno Wiganepdo Soegoto[1], Adam Firdaus Darmawan[2*], Aghnia Dewi Mahiranie[3], Fahma Maulana[4]**
[1]Departemen Manajemen, Universitas Komputer Indonesia, Indonesia
[2,3,4]Departemen Teknik Informatika, Universitas Komputer Indonesia, Indonesia

Email: *adam.10119078@mahasiswa.unikom.ac.id

**Abstract.** The developments that's currently being experienced today are passing very fast and growing exponentially, as well as education, teaching methods from the past cannot be applied into the new era. With utilizing developing technology, teaching methods can be developed to adjust to today's needs. The purpose of this research is to design and develop educational and entertaining picture books to motivate and interest children in learning. This research uses the prototype or designing method with the implementation of Augmented Reality technology into the picture books, where the books will show animation which will draw interest in reading and learning to children. The expected result from this research is the increase of children's literacy interest in Indonesia and implementing the use of books with Augmented Reality in Indonesian education curriculum.

**Keyword:** Augmented Reality, Picture Book, Smart Picture

## 1. Introduction

Education method in 2006, more correctly Characteristics of Education Unit Level or KTSP stated that learning needs to provide cognitive, affective and psychomotor skills. Based on taxonomy Bloom the affective domain consists of: 1) Receiving, 2) Responding, 3) Valuing, 4) Organizing, and 5) Characterization [1]. Based on what research [1] have stated, it can be concluded that the learning method is to have the teacher explain and students respond. This brings some advantages and disadvantages. KTSP will then be replaced by the 2013 curriculum, or what's commonly called Kurtilas. Based on research [2], Kurtilas have four characteristics that differentiate between Kurtilas with other curriculum, that is: 1) Realizing character education, 2) Creating local education, 3) Creating cheerful and friendly education, 4) Education is not only a learning medium. Comparison between the two curriculum can be found in research [2], with the results showed that the advantage of KTSP is that the students is not forced to master all of the subjects and the advantages of Kurtilas is that the students is more emphasized on creative, innovative thinking, and quick-response, also train courage, and Kurtilas to uses natural approach, with the meaning that the learning is more emphasized

International Journal of Research and Applied Technology

2(2)(2022) 198-203

Journal homepage: https://ojs.unikom.ac.id/index.php/injuratech

in experience not knowledge-transfer. As for the drawbacks from each curriculum is that KTSP still uses the test as a benchmark, as for Kurtilas more focused on the teacher capabilities who are still unable to apply the Kurtilas [2]. Students today have begun to be exposed in digital entertainment like games, video, and social media. This leads to the needs of motivation becoming more and more difficult to reach in the school environment. In research [3] implementing an interactive media in technology, information and computer subjects, the conclusion stated that the application of interactive media supports the concept of entertaining learning where the students can feel comfortable when learning. Introducing interactive media has been proven to help students to increase their learning interest in the school environment, by developing this, Augmented Reality can be implemented in teaching methods as an other interesting interactive media.

Similar research that utilizes Augmented Reality technology in education has been widely carried. One of which is in research [4-5] that examine about making an Augmented Reality character model based on colored drawing, explained in this research that the purpose of the research was to introduce a colored picture book with the use of Augmented Reality, from research [4] referenced about similar research, namely research [6], explained in the research that game-based-learning can increase motivation and provide a means for students to learn through game. Research [7] showed that Augmented Reality technology can be developed in different fields such as medical, aviation, marketing, tourism, design, shopping, and of course games. Research [8] explained in more detail about the development of Augmented Reality technology, in the educational field, by developing electronic books as a means of mathematical learning about geometry in elementary school. The difference with previous research is that this research is more focused on designing picture books that can implement Augmented Reality.

The purpose of this study is to design and develop a picture book that can educate and entertain in order to increase children's motivation and interest in learning so that it can be understood how the impact of using Augmented Reality technology on children's motivation and learning performance. The research method used in this study is the prototype method.

## 2. Method

The research method used in this study is the prototype method where the prototype steps include requirements analysis, designing, and making mock-ups. The requirements analysis step is carried out by looking for tools that will be used in this study, using Augmented Reality technology, the first tool to be used is an application called Vuforia and animations are made with the help of Unity and Blender applications. As for other applications, it will be used based on need. The next step is designing, where this step is to design two things, namely designing the content of the book and the 3D model where the 3D model is adapted to the content of the book that has been created. Then, the mock-up step is carried out by designing an application based on a prototype that fits the design that has been made.

## 3. Results and Discussion

### *3.1. Analyzing Requirement*

In this analyzing requirement, there are two requirements including functional requirements and non-functional requirements. Functional requirements are the requirements of a system that has general functionality or usability so that the application can run according

International Journal of Research and Applied Technology

2(2)(2022) 198-203

Journal homepage: https://ojs.unikom.ac.id/index.php/injuratech

to the purpose for which it was made. There are several functional requirements in this picture book application, including:

1. The camera on the device used can detect and capture images on the picture books.
2. The application can display 3D images and animations when the camera captures images that are contained in the picture book.

In addition, there are non-functional requirements which are additional requirements in adding application features or certain other additions in developing the application so that it can be used. The non-functional requirements in this picture book application include:

1. Book design.
2. Illustration or artwork design.
3. 3D animation.

The tools for the above requirements consist of several applications such as Unity and Blender as 3D animation tools, and also design using PaintTool SAI. The application development using Unity and Vuforia as marker creation tools.

### *3.2. Designing*

At this stage, the content of the picture book will be designed. The theme and title ideas are obtained from the results of joint discussions or brainstorming about the story to which an assessment of story ideas will be taken in terms of relevance of the story, the uniqueness of the story, and the ease of the story to be picked up. Furthermore, the concept of the book will be built based on the existing ideas. The focus of this step is in terms of book design, story design, and artwork design. From these three points, it can be continued for storyboarding. The storyboard discusses the storyline from the beginning of events, problems, to the solutions. The storyline will be supplemented with several educational points that are suitable for the target user where the educational points consist of all relevant lessons learned at the target user's age. Educational points and artwork design will be implemented into the creation of 3D animation for use in Augmented Reality creation (see Figure 1 for the schematic).

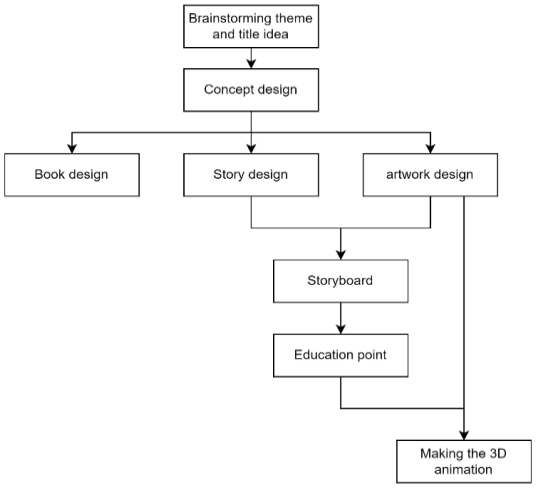



**Figure 1.** Designing Schematic

International Journal of Research and Applied Technology

2(2)(2022) 198-203
Journal homepage: https://ojs.unikom.ac.id/index.php/injuratech

The book cover design can be seen in Figure 2.

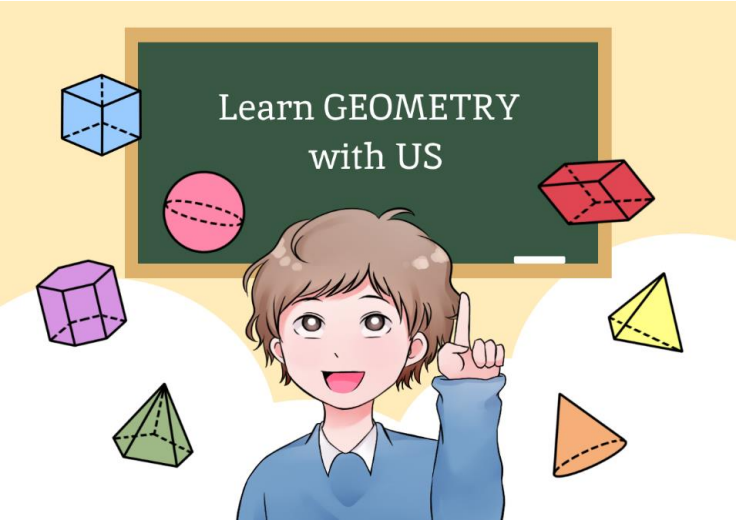



**Figure 2.** The Book Cover Design

As for the marker, we used the picture of The Pyramid of Giza as seen in Figure 3. The marker will work as a scannable picture which will show a 3D model of a pyramid with its detail.

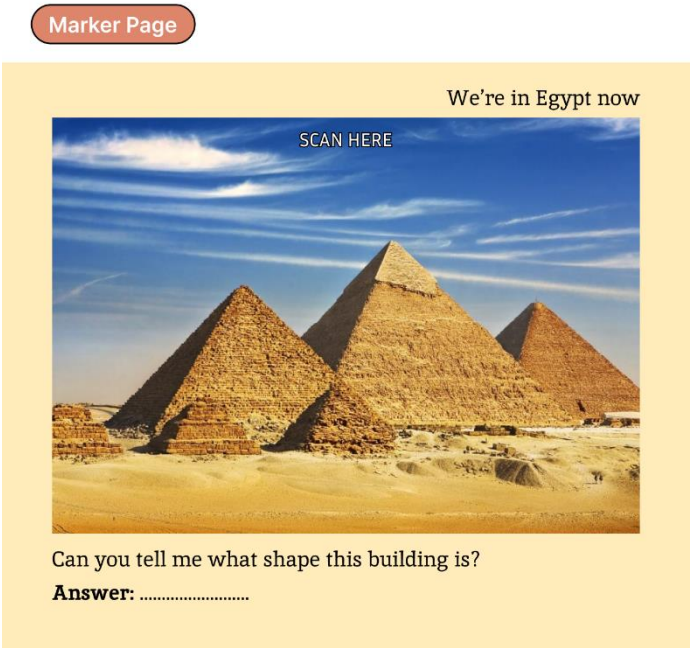



**Figure 3.** The Marker on Smart Picture Book

In Figure 3 there is a note that says "Scan Here" which is directed to the user to scan the picture with a mobile device which then the application will show the 3D model animation.

### *3.3. Application Design*

International Journal of Research and Applied Technology

2(2)(2022) 198-203
Journal homepage: https://ojs.unikom.ac.id/index.php/injuratech

This stage implements Augmented Reality into a picture book using marker-based Augmented Reality method. The way marker-based Augmented Reality works with the application scanning an image that has been identified as a marker. Then, a 3D model will appear on the device. Markers are created by uploading a snippet of an image that will be used as a marker to the Vuforia database. The markers that have been created will be implemented into applications that will be created using Unity. Animations that have been created will also be included in Unity (see Figure 4 for the schematic) [9-10].

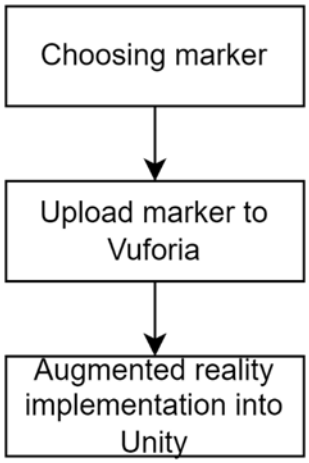
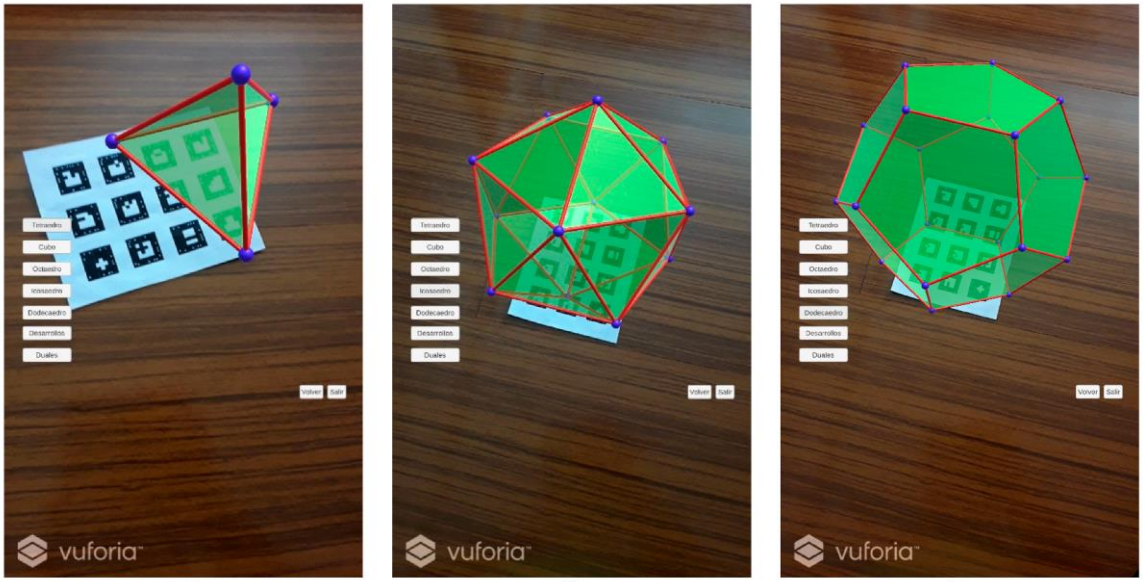



**Figure 4.** Application Schematic

Examples of the expected results in this research shown as Figure 5. The camera will detect the marker that has been uploaded to Vuforia database, the scanned marker will show a 3D model that has been implemented in Unity.




(a) (b) (c)

**Figure 5.** Example of Augmented Reality Models

International Journal of Research and Applied Technology

2(2)(2022) 198-203
Journal homepage: https://ojs.unikom.ac.id/index.php/injuratech

## 4. Conclusion

This smart picture book is designed to help educators and parents in providing motivation and teaching to students. This picture book can be implemented to all teaching methods for any field. Due to its wide and varied application, this technology is appropriate to be appointed as one of the supporting media in carrying out teaching and learning activities both in the school environment and at home.

## Acknowledgement

We would like to thank Universitas Komputer Indonesia and to all parties who have contributed directly or indirectly in the making of this paper.

## References

[1] Ain, N., & Kurniawati, M. (2013). Implementasi kurikulum KTSP: Pembelajaran tematik di sekolah dasar. *Jurnal Inspirasi Pendidikan*, *3*(2).

[2] Gunawan, B. I. (2017). Perbandingan implementasi kurikulum tingkat satuan pendidikan (KTSP) dan kurikulum 2013 di SMAN 1 Sinjai Utara. *Jurnal Mirai Management*, *1*(1), 1-9.

[3] Anwariningsih, S. H., & Ernawati, S. (2013). Development of interactive media for ICT learning at elementary school based on student self learning. *Journal of Education and Learning*, *7*(2), 121-128.

[4] Zhao, H., Huang, P., & Yao, J. (2017, March). Texturing of augmented reality character based on colored drawing. In *2017 IEEE Virtual Reality (VR)* (pp. 355-356). IEEE.

[5] Magnenat, S., Ngo, D. T., Zünd, F., Ryffel, M., Noris, G., Rothlin, G., ... & Sumner, R. W. (2015). Live texturing of augmented reality characters from colored drawings. *IEEE transactions on visualization and computer graphics*, *21*(11), 1201-1210.

[6] Wu, Y., Wu, Y., & Yu, S. (2015). An augmented-reality interactive card game for teaching elementary school students. *International Journal of Educational and Pedagogical Sciences*, *10*(1), 37-41.

[7] Pochtoviuk, S., Vakaliuk, T., & Pikilnyak, A. (2020). Possibilities of application of augmented reality in different branches of education. *Available at SSRN 3719845*.

[8] Adrian, Q. J., Ambarwari, A., & Lubis, M. (2020). Perancangan Buku Elektronik Pada Pelajaran Matematika Bangun Ruang Sekolah Dasar Berbasis Augmented Reality. *Simetris: Jurnal Teknik Mesin, Elektro Dan Ilmu Komputer*, *11*(1), 171-176.

[9] Anwar, Z., Gulfraz, M., & Irshad, M. (2014). Agro-industrial lignocellulosic biomass a key to unlock the future bio-energy: a brief review. *Journal of radiation research and applied sciences*, *7*(2), 163-173.

[10] Anggraeni, R., & Maryanti, R. (2021). Implementation of video learning media in islamic religious education subjects. *Indonesian Journal of Multidisciplinary Research*, *1*(2), 257-266.

[11] Millatina, S. N., Maryanti, R., & Wulandary, V. (2022). Strengthening literacy of cultural arts and crafts in the material of sculpture for 6th-grade elementary school students through learning video media. *Indonesian Journal of Educational Research and Technology*, *2*(3), 189-194.

[12] Anwar, N. O., Okumura, H., Widiyaningtyas, T., & Pujianto, U. (2019, March). Nemu: Design and improvement of visual programming environment as learning support system on basic programming subjects. In *Proceedings of the 2019 7th International Conference on Information and Education Technology* (pp. 54-61).