

Development Education Game Based VAR (Virtual Augmented Reality) in Kindergarten Semarang City

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Abstract:

In making educational game designs that fit the needs of children, an in-depth study is needed, one of them is the way of thinking of the child, in this research an educational game media will be designed that is suitable for the kindergarten children's thinking, we can first make changes to ADDIE analysis model, consist of design, development, dissemination, in the analysis steps of the analysis of the needs analysis with the teacher and children of kindergarten PGRI 73 Semarang added (1) choosing material according to the thematic, (2) the use of media play in class, (3) adjusted the way of thinking of children according to the theory of brunettes that is enactive, econic and symbolic performance learning, (4) educational games must be packaged in the form of pictures and voice commands only kindergarten children can not read, this is as a basis in making media design games education, the next step is to design an educational game media with the following design steps: (1) determining the material / material that you want to be included in the game (2) arrange the Game Play (story line / the player's journey while in the game), (3) create 3D assets such as trees, rocks, clouds, land and related objects using 3D software using Blender Software, (4) Making games (here use Unity Game Engine) arranging all assets according to the gameplay gameplay that has been compiled, (5) Activating the Vuforia Plugin which provides a library that is used to create VR displays, (6) Programming game controls using Bluetooth Game Pad so that users can control the game, (7) Build applications, (8) Test the Bug, after the design of the educational game, then proceed with the validation of material experts with an average rating of 89, 71 and media experts with an average value of 92.31 means that the media is appropriate to use.

Keywords: design, educational game, animal material, kindergarten

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I. INTRODUCTION

The development of Information and Communication Technology is currently developing very rapidly. These developments cause changes in people's behavior and activities in daily life. One technology that is now developing very quickly is information technology and mobile communication (mobile), one of which is a VAR (Virtual Augmented Reality) based game that is able to display interesting virtual objects and added reality. Mobile technology which is currently not only used as a communication tool, but also as a tool to facilitate users in everyday life such as teachers used

in class games (Fejes, A., Johansson, K., & Dahlgren, MA; 2005). This can happen because in mobile technology there are many facilities, including: internet access, e-mail, organizer, music, games and so on that can be used anywhere, anytime faster and easier. The game is a service that is very popular on mobile devices. For this reason the game is also used not only as a fun service but also as a service that provides learning for players (Maitem, J., Cabauatan, R. J., Rabago, L., & Tanguilig III, B .; 2012).

According to Schmitz, B., Czauderna, A., Klemke, R., & Specht, M. (2011) game (game) is a system or program where one or more players make decisions

through control of objects in the game for a particular purpose. Games (games) are computer games that are made with animation techniques and methods. If you want to explore the use of animation you must understand the making of a game (game). Or if you want to make a game, then you must understand the techniques and methods of animation, because the two are interrelated with Denham, A. R. (2015). By playing learning games, the time spent playing the game will not be wasted. This type of game usually has game rules that force players to think about how to finish the game perfectly. This has finally become a challenge for writers to create an educational game that is both fun and useful. In this case, which is making an interesting PAUD thematic learning game. It is hoped that this game will also provide useful learning benefits and play a role in the development of PAUD educational games in the Semarang and surrounding areas.

This study has referred to several previous studies including those conducted by Siswanto (2012) which showed that the making of educational games for Natural Sciences (IPA) in grade VI elementary school students was very interested in learning. Then Nurnawati, E., Yulianti, D., & Susanto, H. (2012). discusses basic educational games for junior high school children. Where in this game there is no game level, but if the player succeeds in completing the game according to the instructions given, there will be an animation or sound that indicates that the player has successfully completed the game. Research on interactive multimedia-based learning media with the object of research in class VI of Elementary School 2 Rowobungkul was conducted by Jones, V. C. (2011). in making a mobile game with the theme of education in Android devices in classroom learning can increase student motivation, the game can entertain as well as provide knowledge and abilities about mathematics. So that it makes the learning process interesting and not boring. explains that educational games based on local Javanese wisdom are very interesting to use in classroom learning and are strengthened by Hwang, G. J., Wu, P. H., Chen, C. C., & Tu, N. T. (2016).that with

Virtual and Augmented Reality-based Games really helps students in learning in class.

Based on this background, researchers will develop an android-based learning media using Augmented Reality (AR). This development is carried out in a study entitled "Design Of Game Education Basic Var (Virtual Augmented Reality) To Learning Animal Material."

II. LITERATURE REVIEW

A. Android Smartphone

In following the latest learning, students are expected to use their smartphones for learning, one of which is Android. Android is an operating system for Linux-based mobile devices that includes an operating system, middleware and applications. (Developers, A.: 2011). Kirthika B. et al (2015: 260) in the journal Android Operating System: A Review says "Android is a software platform and operating system for mobile devices, based on the Linux kernel, and developed by Google and later the Open Handset Alliance (OHA) ". According to Meier, R. (2012), OHA includes a consortium of 34 hardware, software and telecommunications companies including Google, HTC, Intel, Motorola, Qualcomm, T-Mobile and Nvidia.

Android in learning becomes an operating system for the first Linux-based mobile devices that provides an OPENSOURCE (open) platform. This makes it easy for developers to create their applications. Many applications can be made for Android, one of which can be used as a learning medium. Therefore, researchers want to utilize Android as effective learning media.

According to Ibrahim, N., & Ishartiwi, I. (2017). the strengths of Android are 1) Complete (complete platform), developers can take a comprehensive approach when developing the Android platform. Android is a safe operating system and provides many tools for building software and making opportunities for application developers. 2) Android is open (open source platform), Linux-based Android which is open

source or open-source, so it can be easily developed by anyone. 3) Free Platform, Android is a free platform for developers. There are no fees for paying licenses or royalty fees. Android software as a complete, open, free platform and other information can be downloaded for free by visiting the website <http://developer.android.com>. 4) The popular operating system, Android phones are certainly different from the iPhone Operating System (IOS) which is limited to gadgets from Apple, so Android has many manufacturers, with their mainstay gadgets at quite affordable prices.

While Android Weaknesses are 1) Android is always connected to the internet. This Android system smartphone requires an active internet connection. 2) The number of advertisements displayed above or below the application. Although there is no effect on the application being used, this ad is very annoying. 3) Does not save battery power.

The application of Augmented Reality technology is now quite extensive, including in the field of education. Billingham (2002) argues that the use of augmented reality technology in the world of education is still being developed until now because it is not like computing technology in general. The augmented reality interface can integrate users, virtual objects and real environments and in its application to the school environment, there needs to be a collaboration between teachers or tutors and researchers in the field to know the compatibility of the application of augmented reality media with the curriculum in the school.

B. Game Education

Educational Game Educational game is a special learning game specifically for students created based on Virtual Augmented reality, which is able to display virtually and is able to display augmented reality that is of interest to students. This opinion is in line with the conclusion of Kaufman (2000) that as advances in the development of pedagogical concepts, applications, technology and hardware cost reduction, the use of small-scale augmented reality

technology for educational institutions has become very possible in this decade (assuming a careful level of sustainable development). However, the potential of this technology requires careful attention in order to really be utilized to improve educational success.

Azuma (1997) also revealed the reasons for the use of augmented reality technology in the world of education, namely: (1) supporting interaction between real and virtual environments, (2) the use of interfaces that seem real for object manipulation, (3) learning outcomes for smooth transition between environments real and virtual objects. The relevant studies related to the research that researchers will conduct are: Research Achmad Buchori, et al. 2017. Mobile Augmented Reality Media Design with Waterfall Models for Learning Geometry in College shows that PGRI Semarang University students are very interested in using mobile augmented reality in studying geometry course material. So Azuma Research, Ronald T. 1997. A Survey of Augmented Reality. Hughes Research Laboratories. Malibu explains that augmented reality can improve students' spatial ability with added reality. So Research conducted by Permadi, Dendi and Ahmad Rafi. 2015. Developing a Conceptual Model of User Engagement for Mobile-based Augmented Reality Games. So Zheng, R., Zhang. D. and Yang, G. 2015. Seam the Real with the Virtual: a Review of Augmented Reality. Shows that by combining virtual and augmented reality makes learning as if seeing the real world in a fun way.

III. METHOD

This research method was research and development. It is a research method used to produce certain products, and test the effectiveness of these products (Sugiyono, 2010: 407). The research model used the ADDIE learning design model. This model, as the name implies consists of five main phases or stages, namely (A) analysis, (D) design, (D) e-development, (I) implementation, and (E) valuation. The five phases or stages in the ADDIE model, need to be done systematically and systematically

(Sugiyono, 2010: 125). In this study only carried out until the third stage, namely as follows.

1. Analysis

The analysis step consists of two stages, namely performance analysis and needs analysis. The first stage, performance analysis is carried out to find out and clarify whether the performance problems encountered require a solution in the form of program implementation or management improvement. In the second stage, needs analysis is a step that is needed to determine the abilities or competencies that need to be learned by students to improve learning achievement (Sugiyono, 2010: 128).

2. Design

This step requires clarification of the learning program that is designed so that the program can achieve the learning objectives as expected (Sugiyono, 2010: 130). In product design, what is done is the next stage of the ADDIE model, namely design. In this step, there is a need for clarification of the learning program that is designed so that the program can achieve the learning objectives as expected (Sugiyono, 2010: 130).

3. Development

This development step includes creating, buying, and modifying learning media to achieve predetermined learning goals. The step of development, in other words, includes the activity of selecting and determining methods, media and learning strategies that are suitable for use in conveying. In this development stage, the framework that has been designed will be realized to produce a product that can be implemented. At the stage of developing Android-based learning media will be made in accordance with the material after the Android-based media is completed it will be validated by media experts and material experts by the validator to get input and evaluate according to the input provided by the validator. Furthermore, the Android-based media is revised according to the

input provided by the validator to improve the product.

IV. RESULTS AND DISCUSSION

Based on the learning system design procedures used the ADDIE development model, the stages of research implementation for the first year that have been implemented will be explained in detail as follows.

1. Analysis

The analysis step consists of two stages, namely performance analysis or performance analysis and analysis of needs or need analysis. At this stage interviews were conducted with several PAUD teachers in Semarang City. From the results of the interviews it was produced that almost 90% of PAUD schools in Semarang city still use media games or simple games, there is no touch of renewable technology such as augmented reality, virtual reality, and other applications. For this reason, it is necessary to develop learning media that can accommodate these problems. Based on the results of observations made by researchers at TK PGRI 73 Semarang shows that the process of learning mathematics is less active and less interesting, it is caused by the absence of learning media used by teachers so that students become bored quickly. Teaching and learning interactions in the classroom are inseparable from the influence of the media used by the teacher in delivering teaching material. The existence of technology, especially smartphones that are now increasingly developed must be addressed wisely. One of the benefits that can be taken from the existence of this technology is to use it as an effective, creative and educative learning media. So the educational application media can continue to be developed, one of which is the technology of Augmented Reality (AR) and Virtual Reality (VR). This is in accordance with Kordaki, M. (2011) which shows that educational games can increase student motivation

2. Design

At this design stage educational game media using Virtual Augmented Reality (VAR) has been made in accordance with the material, after the android-based media using Virtual Augmented Reality (VAR) is finished, it is first validated by media experts and material experts by the validator to get input and evaluate accordingly input provided by the validator. The results of the validation will be described below.



Figure 1. Design Game Education

3. Development

At the stage of developing android-based learning media using Augmented Reality (AR) would be made in accordance with the material, after the android-based media using Virtual Augmented Reality (VAR) was completed, it would be validated by media experts and material experts by the validator to get input and evaluate according to the input provided by the validator. The results of the validation will be described below.

a. Material Validation

Validation by the material expert is done so that the media that will be tested is truly feasible to be used in research. Development products evaluated by Lecturer at Universitas PGRI Semarang) namely Educational Game based on Virtual Augmented Reality (VAR) using a questionnaire that must be filled out by material experts.

The results of the validation and assessment of the learning material experts for each aspect are presented in the following table.

Table 1. Result of Material Validation

No.	Assessment Aspect	Expected Score	Evaluation Score	Feasibility
1.	Relevance	24	21	87,50%
2.	Accuracy	16	13	81,25%
3.	Completeness of Serving	4	3	75%
4.	Basic Concepts of Material	8	7	87,5%
5.	The suitability of the presentation with the demands of student-centred learning	16	15	93,75%

The next stage the researcher analyzes the overall results of the assessment by material experts.

$$\sum_{n=17} (\text{answer} \times \text{score each choice}) = 59$$

$$\text{highest score} = 4$$

Then the data above is calculated using the following formula

$$\text{percentage} = \frac{\sum (\text{answer} \times \text{score each choice})}{n \times \text{highest score}} \times 100\%$$

$$\text{Percentage} = \frac{59}{17 \times 4} \times 100\%$$

$$\text{Percentage} = 86,76\%$$

From the above calculation, the percentage of eligibility for Virtual Augmented Reality (VAR) based Game Education is 86.76% by the material expert. After being converted to a scale conversion table, Virtual Augmented Reality based Game Education media is in the range of 81% to 100%. So placing the position on the criteria is very good.

Comments on expert learning materials (validation of expert judgment of materials) in general, namely the material presented is more adapted to everyday life. Comments and suggestions from learning material experts are taken into consideration for improving the design of

Augmented Reality (AR) based game education media, following up on comments and suggestions from the validator of learning material experts, it is necessary to make revisions to Virtual Augmented Reality based Game Education media). The revision made is by giving contextual problems that are in accordance with students' daily lives.

b. Media Validation

Validation by media experts is done so that the media that will be tested is really feasible to be used in research. Development products evaluated by media experts Lecturer of Information Technology at Universitas PGRI Semarang, which is an Virtual Augmented Reality (VAR) based Game Education using a questionnaire that must be filled out by media experts.

The results of the validation and assessment by media experts for each aspect are presented in the following table.

Table 2. Result of Media Validation

No.	Assessment Aspect	Expected Score	Evaluation Score	Feasibility
1.	General Display	24	22	91,67%
2.	Special Display	12	10	83,33%
3.	Media Presentation	16	15	93,75%

The next stage the researcher analyzes the overall results of the assessment by media experts.

$$\sum_{n} (\text{answer} \times \text{score each choice}) = 47$$

$$n = 13$$

$$\text{highest score} = 4$$

Then the data above is calculated using the following formula:

$$\text{Percentage} = \frac{\sum (\text{answer} \times \text{score each choice})}{n \times \text{highest score}} \times 100\%$$

$$\text{Percentage} = \frac{47}{13 \times 4} \times 100\%$$

$$\text{Percentage} = 90,38\%$$

From the above calculation, the percentage of eligibility for Virtual Augmented Reality (AR) based Game education is 90.38% by media experts. After being converted to a scale conversion table, Virtual Augmented Reality (VAR) based Game Education media is in the range of 81% - 100%. So placing the position on the criteria is very good.

Media expert comments (validation of media expert judgment) in general, namely the Augmented Reality (AR) based game education can be used in kindegarten learning and the Virtual Augmented Reality (VAR) based Game Education media is an interesting product, hopefully, this media can be applied in play store so students can easily download it. Comments and suggestions from media experts are taken into consideration for improving the design of the game education media based on Virtual Augmented Reality (VAR), following up on the comments and suggestions from the validator of media experts, it is necessary to make revisions to the Virtual Augmented Reality (VAR) based Game education media. The revision is to manage Android users by registering students who have an Android so that all students can learn to use Android, glas VR and try this media to be applied later in the Play Store.

V. CONCLUSION

The conclusions of this study are (1) Produced android-based learning media products using Virtual Augmented Reality (VAR) called game education based on virtual augmented reality in which discussing kindegarten material, (2) Development of Virtual Augmented Reality Based Game education Media is valid and suitable for use by students. This can be seen from the assessment of material experts, media experts, and student responses where the results are in very good criteria.

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VI. REFERENCES

- [1] Azuma, Ronald T. 1997. A Survey of Augmented Reality. Hughes Research Laboratories. Malibu.
- [2] Buchori, Achmad, dkk. 2017. Mobile Augmented Reality Media Design with Waterfall Model for Learning Geometry in College. International Journal of Applied Engineering Research ISSN 0973-4562, Vol 12, No 13, pp. 3773-3780.
- [3] Billingham, M., & Kato, H. (2002). Collaborative augmented reality. Communications of the ACM, 45(7), 64-70.
- [4] Developers, A. (2011). What is android.
- [5] Denham, A. R. (2015). Strategy instruction and maintenance of basic multiplication facts through digital game play. In STEM Education: Concepts, Methodologies, Tools, and Applications (pp. 290-309). IGI Global.
- [6] Fejes, A., Johansson, K., & Dahlgren, M. A. (2005). Learning to play the seminar game: students' initial encounters with a basic working form in higher education. Teaching in Higher Education, 10(1), 29-41.
- [7] Harris, A., & Jones, M. (2011). Professional learning communities in action. Leannta.
- [8] Hwang, G. J., Wu, P. H., Chen, C. C., & Tu, N. T. (2016). Effects of an augmented reality-based educational game on students' learning achievements and attitudes in real-world observations. Interactive Learning Environments, 24(8), 1895-1906.
- [9] Ibrahim, N., & Ishartiwi, I. (2017). PENGEMBANGAN MEDIA PEMBELAJARAN MOBILE LEARNING BERBASIS ANDROID MATA PELAJARAN IPA UNTUK SISWA SMP. Refleksi Edukatika: Jurnal Ilmiah Kependidikan, 8(1).
- [10] Kaufmann, H. (2003). Collaborative augmented reality in education. Institute of Software Technology and Interactive Systems, Vienna University of Technology.
- [11] Kordaki, M. (2011). A computer card game for the learning of basic aspects of the binary system in primary education: Design and pilot evaluation. Education and Information Technologies, 16(4), 395-421.
- [12] Kirthika, B, dkk. 2015. Android Operating System: A Review. International Journal of Trend in Research and Development, Vol. 2(5), ISSN 2394-9333.
- [13] Maitem, J., Cabauatan, R. J., Rabago, L., & Tanguilig III, B. (2012). Math world: A game-based 3d virtual learning environment (3d vle) for second graders. arXiv preprint arXiv:1203.1964.
- [14] Meier, R. (2012). Professional Android 4 application development. John Wiley & Sons.
- [15] Meimulyani, Yani & Caryoto. 2013. Media Pembelajaran Adaptif. Jakarta: Luxima.
- [16] Nurnawati, E., Yulianti, D., & Susanto, H. (2012). Peningkatan kerjasama siswa SMP melalui penerapan pembelajaran kooperatif pendekatan think pair share. UPEJ Unnes Physics Education Journal, 1(1).
- [17] Permadi, D., & Rafi, A. (2015). Developing a conceptual model of user engagement for mobile-based augmented reality games. Jurnal Teknologi, 77(29).
- [18] Schmitz, B., Czauderna, A., Klemke, R., & Specht, M. (2011, April). Game based learning for computer science education. In Computer science education research conference (pp. 81-86). Open Universiteit, Heerlen.
- [19] Siswanto, W. A., & Darmawan, A. S. (2012). Teaching finite element method of structural line elements assisted by open source FreeMat. Research Journal of Applied Sciences, Engineering and Technology, 4(10), 1277-1286.
- [20] Sugiyono, P. Dr. 2010. Metode Penelitian Kuantitatif, Kualitatif, dan R&D. Bandung: CV Alfabeta.
- [21] Zheng, R., Zhang, D., & Yang, G. (2015, March). Seam the real with the virtual: a review of augmented reality. In 2015 Information Technology and Mechatronics Engineering Conference. Atlantis Press.