

Development of Learning Media for Learning Beginning Reading Based on Augmented Reality for Autistic Children

Lailatul Fitria

Universitas Muhammadiyah Sidoarjo – Jl. Mojopahit 666 B Sidoarjo

E-mail: lailatul622@gmail.com

Abstract: This research is motivated by the characteristics of autistic children who are very complex. Autistic children have two main characteristics, namely obstacles in social communication and behavior (DSM V). Inside, this is following the ability of children with autism which then becomes an advantage to be given in the visual form (sensory process). Visual ability is a significant factor in making the beginning of Augmented Reality-based reading learning media design for autistic children. This type of research is R&D research development. The research step adopts the Thiagarajan 4D theory (Determine, Design, Development, and Dissemination) with implementation up to the development step. The object of this research is the early class autism class at the inclusive school, namely UPT SD Lemah Putro 1 (2nd classes) dan SD Muhammadiyah 2 Tulangan (2nd classes). Trials on respondents were conducted on specialists in special needs, class, and accompanying teachers. Based on the validation results and the results of the questionnaire, respondents stated that the media for learning to read in the beginning based on augmented reality for autistic children can be applied with the approval of the average validity of 4.71 and the average results of the average trials on respondents 99.46%.

Keywords: autistic children; reading the beginning; augmented reality (AR)

INTRODUCTION

Autism is an inability to interact characterized by disturbances in communication such as social interactions, eye contact, language, refusal to speak, and so on. Although children with autism have different symptoms, some children with autism are hyperactive and aggressive or self-active, but some are passive (Nazaruddin & Efendi, 2018; Syofiyawati, Asrowi, Gunarhadi, & Fadhilah, 2017). Children with this disorder tend to have difficulty controlling emotions and are often electrocuted (crying and throwing tantrums). Symptoms often affect the interaction of children with autism in their school environment.

Students with autism are characterized by the student's inability to make eye contact when interacting. Meanwhile, eye contact is the main thing needed in interaction. According to Qumalasari (2017), one of the disorders experienced by autistic children in interacting is eye contact, "so they need learning methods that stimulate students' attention." Observations show that students in the learning process are not focused when the teacher explains in front. Then the researchers tried to explore the reading ability of autistic students. Students can read quite well (there is an incorrect pronunciation). However, there is still a lack of understanding of the sentences being read so that when questions are asked related to the reading being read,

students stay silent and look away. This then becomes a particular concern in this study.

Currently, the prevalence of children with special needs with behavioral development barriers, including autism, has experienced a surprising increase. For example, in Pennsylvania, the United States, the number of children with special needs has increased by 500% to 40 out of 10,000 births in the last five years. So far in Indonesia in 2013, it is estimated that there are more than 112,000 children with autism aged 5-19 years. While in Sidoarjo, according to data from UPT, in children with special needs in 2015, there were approximately 50 children with autistic disorders.

In this study, they are observing autistic students in elementary schools (inclusive schools). Observations were carried out in two elementary schools, namely SD Lemah Putro 1 Sidoarjo and SD Muhammadiyah 2 Tulangan Sidoarjo and the School for Mother's Mind Therapy. Based on observations at the school, there are students with special needs types of autism. The observations made include direct observation of student activities in class, observing students when socializing with classmates during class breaks, collecting data on student psychological test results, and conducting interviews with class teachers and accompanying teachers. The autistic students who were observed showed several characteristics of a child with autism.



Figure 1. Diagram of the steps for using the Research and Development (R&D) method according to Thiagarajan (1974).

These characteristics such as laughing alone, repeatedly clapping, jumping up and down, saying the same sentence or word over and over, avoiding eye contact when spoken to, low empathy, tugging at the shoulder of the shirt repeatedly -repeat and so forth (Identification of the Characteristics of Autistic Children) (Efendi, 2006; Rosadi, 2018). The identification is then classified into several aspects: communication, social interaction, repetitive behavior, and limited interest (Andergassen, Mödritscher, & Neumann, 2014). The following is a classification diagram for the identification of autistic characteristics.

The diagram explains that the Diagnostic and Statistical Manual of Mental Disorders (DSM IV) identifies the characteristics of autism based on Triadic aspects, namely social, communication, and behavior. However, this statement changed the diagnosis to Dyadic, a characteristic of autism based on social communication and behavior. Below is a description of each of the characteristics of children with autism: 1) Difficulties in communication and social interaction in all contexts, namely a) difficulties in social-emotional reciprocity; b) problems with non-verbal communicative behavior; c) difficulties in developing, maintaining, and understanding relationships. 2) Limited interest and repetitive behavior in children with autism: a) motor movements, use of objects or stereotypical or repetitive speech (such as flapping hands); b) insistence on equality, inflexibility, adherence to verbal or non-verbal routines, rituals, or patterns of behavior; c) minimal attention or interest fixed on one thing in an only abnormal intensity; d) hyper or hypo-reactivity to sensory input or unusual importance in sensory aspects of the environment.

METHOD

This research uses the Development Model, which is used to develop the development model proposed by Thiagarajan, who suggests that the development research stages are divided into 4 development steps, the defining stage, the product design stage, and the development, and the dissemination stage. (Sugiyono, 2016) However, in this study, up to the development of the limitations of researchers.

This research was conducted at the UPT SDN Lemah Putro 1, SD Muhammadiyah 2 Tulangan, and

the Mother's Heart Therapy School. The research took place from May into July 2019. The object of this study was students with autism in their early grades.

This research is planned to start from searching for data or findings in the field, followed by a media design process validated by Indonesian language expert lecturer validators, Information Engineering expert lecturer validators, and Informatics Engineering expert lecturer validators at the Muhammadiyah University of Sidoarjo. Finally, the process of validating a design that has been feasible and valid after going through several revisions is continued at the media trial stage in inclusive schools.

This study's data collection techniques are observation, interviews, literature study, and validation (Oelke et al., 2015). The data used in this study are student assessment results, daily observation sheets, the number of validations, and product trials. The data obtained were then analyzed quantitatively and qualitatively on the feasibility of the media and the results of product trials in inclusive schools. Literature study analysis is used as data in making media designs.

FINDINGS & DISCUSSIONS

Findings

The results of this study are the characteristics of children with autism in each school. The results of observations in inclusion and therapy schools found that each child's character with autism is different for each person. As already explained, autistic children have a spectrum, levels, and levels. To determine the spectrum and level based on the assessment results from the Psychology RSUD Sidoarjo and observations at the school. Based on observations, it was found that the characteristics of autistic children have obstacles in communication and social interaction, as well as repetitive behavior and limited interest. It is the first step in research, namely Define. Based on these findings, a media design is made, which in general can be classified, table 1.

The advantages and weaknesses of the design can be described. The advantages are; 1) Media design is an application that can be used on Android, 2) Provides easy recognition of pronunciation of letters, 3) There are exciting objects and colors in the context of letter recognition to reading sentences, 4) The completeness of the indicators for initial reading is correct. The weaknesses are; 1) This design does not have a transparent prototype in the form of a simple application, so it is still abstract; 2) The use of absorption letters such as Q and Y is not apparent in object recognition, 3) the design is still a rough description and unclear.

Table 1. Characteristics of Autistic Children Used as a Basis for Making Media (Atmaja, 2018)

No.	Capability	Description
A. Aspects of Communication and Social Interaction		
1.	Passive Group	Is a child who can accept a social approach and can play with other children even though the game is according to his wishes
2.	Active Group	Children with this type will usually approach other children spontaneously, but their interactions and what they do are inappropriate and are often just themselves or one-sided.
B. The aspect of Independence Prediction		
1.	Moderate Prognosis	Where there is progress in the social and educational fields even though behavioral problems remain (1/4 of people with total autism)
2.	Prognosis Baik	Children who have an everyday social life can be almost normal and function well in a school environment. Unfortunately, this is found in (1/10 of all people with autism). Autism with this type can be said to be independent autism.
C. Aspect of Intellectual		
1.	IQ 50-70	Children with the results of this test are autistic with mild mental retardation—a prevalence of 20% of autistic children.
2.	IQ 70>	It is an autistic child who does not have and is mentally retarded, with 20% of autistic children.

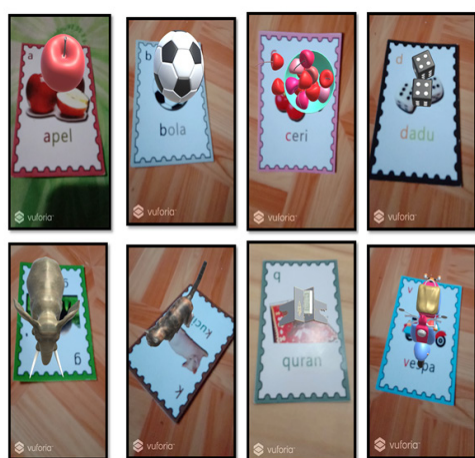


Figure 3. Display of Augmented Reality Preliminary Reading Application

The media created is then developed according to the characteristics of children with autism that are expected through the product validation process. The following is the development of an augmented reality-based preliminary-reading application for children with autism.



Figure 2. Menu Display in Preliminary Reading Application (Indicator reading beginning)

The camera as a tool for scanning the alphabet card, after the card is scanned, a three-dimensional object will appear according to the image on the alphabet card on the cellphone screen accompanied by a sound containing the writing of the scanned card, for example, when the AR camera is pointed at the apple card, then apple object will automatically appear along with the sound “a for apples,” and so on applies to each card. The second preliminary reading indicator is spelling. Students are introduced to how to read each letter (consonants with vowels). The use of this application is accompanied by the teacher so that students who still do not understand can be helped to press the speaker button, which automatically displays the sound of how to read these letters. This scene continues until the letter “z” except for the vowels a, i, u, e, o.

Furthermore, students are guided to read on the “Reading Sentences” menu. The menu contains simple sentences and pictures. The assistant teacher has a role to see if students can read without voice assistance and can recall what they have learned on the “Mengeja” menu. The development is carried out in the form of an application, and it is continued in the product validation process. Several experts have carried out this validation process, including lecturers of engineering experts, lecturers of Indonesian language experts, and lecturers of information technology experts. Then it was tried out at Lemah Putro 1 State Elementary School, Tulangan 2 Muhammadiyah Elementary School to get the expected content or material development. Furthermore, data analysis of validation and test results can be seen in the data analysis section.

Discussion

The several characters or traits possessed by autistic children vary greatly, depending on each type of autism. In this research, the development of reading learning media for children with autism is made based on the characteristics of disorders of autistic children in general and based on the findings of problems in the field. This is intended so that autistic children, in general, can use reading media, especially in learning to read at the beginning of autistic children in elementary school.

Reading is an activity of seeing and understanding and interpreting something in written symbols or prints. Reading is not a subject but a process that requires an object (Styaputra & Ummah, 2015). It should be noted that reading is a process that is taught, trained, or improved, and this process is not something that happens incidentally or naturally possesses potential because no child can read only by seeing other people reading but must be learning. Reading is a process of changing the form of symbols/signs/writing into meaningful sound forms.

According to Farida in her book, she states that reading is interactive. Reader's engagement with text depends on the context. People who like to read will meet the goal in the reading process, which is to understand the reading content. However, it is different if someone can read but cannot understand the contents of the reading so that the purpose of reading cannot be achieved (Rahim, 2008). This definition is very important to understand the content of reading in children with autism who have several disorders, such as the identification results of children with autism. Thus, reading comprehension in autistic children can be achieved through striking images and objects by utilizing the light sensitivity and imagination possessed by autistic children. In this case, autistic children will be introduced to letters and read by spelling up to reading sentences (reading the beginning).

Augmented Reality in Indonesian is translated into Additional Reality is a technique that combines two-dimensional and three-dimensional virtual into a three-dimensional object and then projects these virtual objects in real-time (Pamoedji & Maryuni, 2017). Augmented Reality, often abbreviated as AR, is different from Virtual Reality, often called VR. Augmented Reality is not like Virtual Reality, which completely replaces reality, Augmented Reality is just adding or completing the reality (Syahputra et al., 2018).

The process of making applications based on Augmented Reality also requires an application and a website to support the creation of the application. Although these two components are closely related

to the AR-based application creation process, the application is Android Studio and the Vuforia website. So that in the process of making this application, it must be connected to the internet network. Android Studio is an application that validates the application so that it can function on an Android phone. At the same time, Vuforia is an image uploading website (card) that later appears as a four-dimensional object when scanned. Here are some simple descriptions of the stages of making Augmented Reality applications.

CONCLUSIONS

Based on research on the development of Augmented Reality-Based Teaching Learning Media for Autism, conclusions can be drawn 1) Development of Augmented Reality-Based Preliminary Reading Learning Media for Autistic Children refers to the 4D development model developed by Thiagarajan, adapted into the 4P form, namely the defining, designing, development and dissemination, 2 Indonesian language experts carry out an assessment of the feasibility of Teaching Learning Media for Beginning Reading Based on Augmented Reality for Autistic Children, educational information technology experts and informatics technology experts. The results of the validation assessment by the expert obtained an average score of 4.71, which is included in the (very good) criteria for use in the UPT SDN Lemah Putro 1 with the acquisition of an eligibility percentage of 91.23%. Meanwhile, the percentage of eligibility at SD Muhammadiyah 2 T Adventure is 99.46% which is included in the criteria (very thorough).

REFERENCES

- Andergassen, M., Mödritscher, F., & Neumann, G. (2014). Practice and repetition during exam preparation in blended learning courses: Correlations with learning results. *Journal of Learning Analytics, 1*(1), 48-74.
- Atmaja, J. R. (2018). Pendidikan dan bimbingan anak berkebutuhan khusus. *Bandung: PT Remaja Rosdakarya*.
- Efendi, M. (2006). Pengantar psikopedagogik anak berkelainan. *Jakarta: Bumi Aksara*.
- Nazaruddin, M. A., & Efendi, M. (2018). The book of pop up augmented reality to increase focus and object recognition capabilities for children with autism. *Journal of ICSAR, 2*(1), 9-14. <https://doi.org/10.17977/um005v2i12018p009>

- Oelke, M., Becher, K., Castro-Diaz, D., Chartier-Kastler, E., Kirby, M., Wagg, A., & Wehling, M. (2015). Appropriateness of oral drugs for long-term treatment of lower urinary tract symptoms in older persons: results of a systematic literature review and international consensus validation process (LUTS-FORTA 2014). *Age and Ageing*, 44(5), 745–755.
- Pamoedji, A. K., & Maryuni, R. S. (2017). *Mudah Membuat Game Augmented Reality (AR) dan Virtual Reality (VR) dengan Unity 3D*. Jakarta Pusat: Elex Media Komputindo.
- Qumalasari, R. A. (2017). *Pengaruh metode syllabic terhadap keterampilan membaca per-mulaan anak kelas 1 di SLB Autis Laboratorium Universitas Negeri Malang* (Doctoral dissertation, Universitas Negeri Malang).
- Rahim, F. (2008). *Pengajaran membaca di sekolah dasar*. Jakarta: Bumi Aksara.
- Rosadi, N. (2018). *Pengembangan Instrumen Identifikasi Jenis Anak Berkebutuhan Khusus (Abk) Di Sekolah Dasar*. Universitas Muhammadiyah Sidoarjo.
- Styaputra, F. O. A., & Ummah, U. S. (2015). Meningkatkan Kemampuan Menulis dan Membaca Siswa Tunanetra Melalui Puzzle Braille. *Jurnal Penelitian dan Pengembangan Pendidikan Luar Biasa*, 2(1), 27-29. Retrieved from <http://journal2.um.ac.id/index.php/jppplb/article/view/4327>
- Sugiyono. (2016). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif Dan R&D*. Bandung: Alfabeta.
- Syahputra, M. F., Arisandi, D., Lumbanbatu, A. F., Kemit, L. F., Nababan, E. B., & Sheta, O. (2018). Augmented reality social story for autism spectrum disorder. *Journal of Physics: Conference Series*, 978(1), 12040. IOP Publishing.
- Syofiyawati, N. R., Asrowi, A., Gunarhadi, G., & Fadhilah, S. S. (2017). The Improvement of Down Syndrome Children's Independency Through Vocational Skill Training. *Journal of ICSAR*, 1(2), 159-161. <https://doi.org/10.17977/um005v1i22017p159>