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Curriculum Development Process with Personalized Learning Model in Early Reading for Autism Spectrum Disorder Students

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Abstract: Reading can be a way to increase students' social interaction and writing, especially for the need to continue to a higher level of education. Students with Autism Spectrum Disorder (ASD) show deficits in reading skills. Recent research shows that there is heterogeneity in this population, which is accompanied by a lack of personalized learning facilities. That way, there is a gap between students, learning, and the support they need. This research aims to produce a curriculum design based on personalized learning with the help of interactive media in beginning reading skills. The curriculum development model used is the Nicolls model. The results of the study show that curriculum development using the Nicholls model can be used for curriculum development in Special Schools (SLB). This is because the model emphasizes contexts and situations where curriculum decisions need to be made. In addition, the results of a limited trial show that this curriculum design is effective for students with ASD. This can be seen from the increase in student learning outcomes in beginning reading skills, especially in introducing words, syllables, and letters. Future research is described in this paper.

Keywords: curriculum development, personalized learning, autism spectrum disorder, early reading, sas method

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Introduction

Reading skills are cognitive abilities combining information interactions and individual knowledge bases to achieve reading goals (Richards & Burns, 2012; Mart, 2012; Bojovic, 2010; Cline, Johnstone, & King, 2006). Meanwhile, with their reading skills, readers can create new knowledge and information that can be shared with others (Zajic, Solari, Grimm, McIntyre, & Mundy, 2020; A.Thompson & SusanSonnenschein, 2016). The

importance of mastering reading skills has the essential skill of listening to someone speak, and they have higher success in writing when they have a strong knowledge base through extensive reading (Richards & Burns, 2012). In addition, reading supports academic skills in continuing to the next level of education (Kaya, 2015). Thus, reading skills become a fundamental skill to be mastered by every student.

Most reading studies involving children with Autism Spectrum Disorder (ASD) have reported specific challenges with reading comprehension as well as the ability to read words as a whole (Zuccarello, et al., 2015; Brown, Oram-Cardy, & Johnson, 2013; Nally, Healy, Holloway, & Lydon, 2017). However, more recent investigations have highlighted that children with ASD exhibit a variety of reading profiles that differ across a range of reading sub-skills, including phonological awareness, decoding, fluency, and comprehension (Johnels, Carlsson, Norbury, Gillberg, & Miniscalco, 2018; Nation, Clarke, Wright, & Williams, 2006; McIntyre, et al., 2017; Singh, et al., 2017). This is because students with ASD have brain development disorders that affect language skills, one of which is in the aspect of reading (Nally, Healy, Holloway, & Lydon, 2017; Paramesti et al., 2021; Munir et al., 2018).

The changing conditions of society, schools, and students support the view of curriculum development as a never-ending activity (Nicholls & Nicholls, 2018). In its implementation, educators of students with ASD in Special Schools (SLB), have been challenged with the hope of improving their students, both in terms of daily and academic skills (Petersen, 2016). However, the diversity of students with ASD continues to increase (Nilsen, 2017). Meanwhile, the teaching system in the classroom provides the same learning resources to different students, so there is concern that there is a neglect of student learning needs (Zhou, Zhang, Zhang, & Xu, 2021; Khoirunnisa et al., 2021). That way, there is a gap between students, learning, and the support they need. This is a challenge for educators to learn according to their abilities (Mariage, Englert, & Plavnick, 2021; Munir et al., 2021). Until recently, teachers struggled to differentiate reading instruction for children with ASD (Accardo & Finnegan, 2017).

Based on the description above, the authors designed a study to develop a personalized learning model-based curriculum using augmented reality to improve ASD student's reading skills. With this in mind, the author tries to offer a new perspective on curriculum implementation, which is implemented through personalized learning models and technology.

Method

The process of developing a personalized learning-based curriculum assisted by AR media in the early reading skills of ASD students uses the Nicholls curriculum development model (Nicholls & Nicholls, 2018), which consists of five stages, namely: (1) Situational analysis; (2) Selection of objectives; (3) Selection and organization of content; (4) Selection and organization of methods; (5) Evaluation. Nicholls & Nicholls (2018) emphasize a rational curriculum development approach, especially the need for a curriculum that arises from

changing situations. They argue that change must be planned and introduced rationally and validly according to a logical process, which has not been the case in most changes. The existing stages facilitate the alignment of teaching and assessment and the alignment of teaching and curricular goals (Trachtenberg, 2020).

In the situational analysis stage, interviews were conducted with the Principal, distributing questionnaires to class teachers, and reviewing documents. In addition, make observations to identify and analyze student characteristics related to learning outcomes. The results of interviews, questionnaires, and observations were collected by selecting essential points according to research needs. At the selection of objectives stage, the determination of learning objectives was formulated by looking at the syllabus of the 2013 curriculum on Indonesian subjects and based on the results of the ASD students' initial reading ability, who then conducted focus group discussions with ASD experts. At the selection and organization of the content stage, the teaching materials used were adjusted to the student's abilities, and discussions were held with ASD experts as well as Indonesian books for elementary schools in determining them. Then in the selection and organization of methods, the method chosen is the Structural Analytic Synthetic (SAS) reading method with a personalized learning (PL) model. The SAS method can meet the needs of curious children, and educators try to provide teaching materials appropriate to the development and experience of children's language; with the SAS method, teaching materials are given through a structured approach. This method begins with the presentation of words break down into syllables and letters that stand alone and recombined them starting from letters into syllables and words. Meanwhile, the PL model selected to increased student involvement and achievement. It is hoped that motivation and learning focus will increase significantly in personalized learning in line with students' interests. The steps in this PL model are conveying goals and preparing Students, Organizing Student Choices and Votes, Accessing Information, Developing Knowledge, and Providing Feedback. In addition, the media used in the learning process is Augmented Reality (AR), with the development flow using the Linear Sequential Model by Pressman (Pressman, 2015). Finally, at the evaluation stage, it is carried out on all curriculum components to obtain an overview of the quality of a product. Expert judgment was carried out by one curriculum expert and an autistic expert, as well as an analysis of the improvement in learning outcomes for four students using the Early Grade Reading Assessment (EGRA) instrument (Gove & Wetterberg, 2011).

Results

The results of the situational analysis stage found that students have different abilities in this beginning reading skill. In reading the word, some students still need help. On the other hand, some students still cannot distinguish the pronunciation of the letters m and n, as well as p and b. Students learning styles are different; some like to be complemented by music and pictures and interspersed with drawing or coloring. The development of *Bahasa Indonesia* curriculum, especially in reading skill material, has not been developed optimally according to the needs of students. Materials and evaluations given to students have not been adapted to the abilities of students. The selection of objectives stage gives results as shown in Table 1.

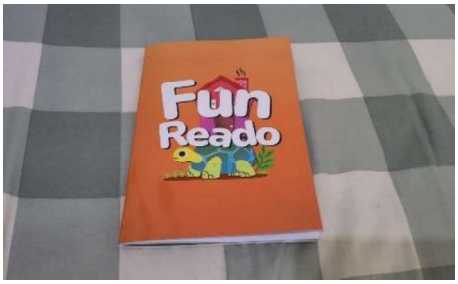
Table 11. Basic Competencies, Indicators, and Learning Objectives

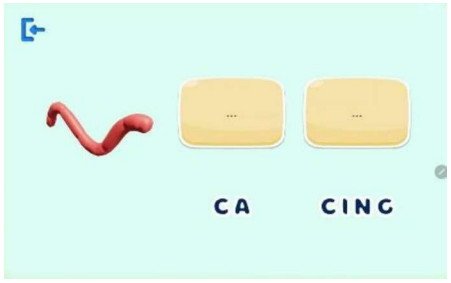
Material Load	Basic Competency	Indicator	Learning Objectives
Bahasa Indonesia – Reading	Describe vocabulary about various types of objects in the surrounding environment through short texts (pictures, writing, and/or song lyrics) and/or environmental exploration.	Shows letters in Indonesian / local language vocabulary	Students are able to show letters in Indonesian / local language vocabulary
	Pronouncing vocabulary about various types of objects in the surrounding environment through short texts (pictures, writing, and/or song lyrics) and/or environmental exploration.	Pronounce vocabulary in Indonesian / local languages	Students are able to pronounce vocabulary in Indonesian / local languages.
		Pronouncing syllables in Indonesian / local language vocabulary	Students are able to pronounce syllables in Indonesian / local language vocabulary.
		Pronouncing letters in Indonesian / local language vocabulary	Students are able to pronounce letters in Indonesian / local language vocabulary.

At the selection and organization of content stage, teaching materials are provided according to students' initial reading abilities. Students are grouped into three groups as follows: (1) Group one is for students who are able to pronounce vocabulary with the correct pronunciation according to the sounds of Indonesian vocabulary and sound clear and without assistance; (2) The second group is intended for students who are quite capable of reciting vocabulary with sufficient pronunciation according to the sounds of Indonesian vocabulary and clear voices and with a little assistance; (3) The third group is for students who are less able to pronounce vocabulary with pronunciation that does not match the sounds of Indonesian vocabulary and sounds that are not clear and with a lot of help. Students who belong to group 1, choose words with the form CVCCVC and two to three syllables. Group 2 selected words with the CVCVC form and two syllables. Meanwhile for group 3, the words with the CVCV form and two syllables were chosen. The material content displayed on the AR was validated by an autistic expert.

The selection and organization of methods stage produces an application based on Augmented Reality using a personalized learning model and the SAS reading method. The resulting learning activities are listed in Table 2.

Table 12. AR-assisted Personalized learning activities

Syntax	Learning Activities	Learning Activities on AR Media
Delivering Goals and preparing Students	Teacher: 1. Prepare students to take part in lessons physically and psychologically by providing motivation 2. Convey the learning objectives and outline of the initial reading material 3. Convey how to use the media 4. Showing the video as a step in apperception	In AR media, videos are shown as steps in Apperception. The video contains chants in recognition of the alphabet A-Z. 
Organizing Student Choices and Votes	Teacher: 1. Give students the opportunity to choose initial reading material that they have not mastered 2. Provide material suggestions according to the results of the reading skills assessment if students cannot choose material Student: 1. Communicating interest and desire in learning to read 2. Determine the initial reading material to be studied	In AR media, students are directed to choose groups according to the results of the preliminary reading assessment.  After that, students can choose the material in the FunRead book that they will study according to their interests. In the book there are 15 words that can be learned by students. 

		
Information Access	Teacher: 1. Guiding students to access information about beginning reading material on the media 2. Give students the opportunity to ask for help Student: 1. Access information about initial reading materials on the media 2. Ask for help if there are difficulties in the learning process	In this syntax, the teacher guides students in scanning markers on books as material to be studied by students. The reading method used is the SAS method so that there is a button to replace changes to the stages of the SAS method on AR media.  If students are able to use AR media, the teacher gives students the freedom to explore the material they will learn and provides space for students to ask questions.
Develop knowledge	Teacher: 1. Helping students to do exercises on the media as a form of knowledge development 2. Helping students to validate the knowledge they have acquired Student: 1. Do the exercises that have been provided by the teacher 2. Pay attention to the teacher in validating the knowledge he has acquired	In this syntax, students are given practice questions in the form of drag and drop. In the first exercise, students are instructed to compose words from syllables.  The second exercise, students are instructed to show the letters according to what is ordered.

		
Giving Feedback	Teacher: 1. Provide feedback if students can do the exercises correctly 2. Give encouragement to try again if students do not get knowledge correctly according to orders Student: 1. Get feedback from the teacher on the activities he is doing	In this syntax, giving feedback is done based on the answers to practice questions.   This feedback is complemented by a sound corresponding to the positive feedback or encouragement to try again.

Finally, at the Evaluation stage, Expert judgment from experts shows that this personalized learning-based curriculum is feasible to be tested with some improvements. These improvements include adding degrees to learning objectives, simplifying instructions on AR applications, and adding material. Limited trials yielded positive results. This can be seen in the increase in student learning outcomes in reading words and syllables from the initial to the final baseline. However, the most insignificant increase was in the material to recognize letters because while at school, students have been taught to recognize letters. However, some students have problems recognizing letters with similar shapes and pronunciations.

Discussion

In the curriculum development process, it is essential to know the conditions in the field, and this is necessary because it is a guide in improving learning practices in schools (Outer, Handley, & Price, 2013). Interviews with school principals yielded that support from various parties, such as stakeholders and school members, in

implementing the curriculum was the primary key to implementing a program. As a result of research conducted by Cheung & Wong (2012) that, teachers believe a team culture allows colleagues to have the same goals and implementation strategies to work collaboratively, plus working together, they believe, will increase the efficiency of curriculum implementation. The readiness and confidence of teachers need to be increased so that learning can run effectively and increase students' knowledge (Ramli, et al., 2017). Research conducted by Mutiah, Nakhriyah, HR, Hidayat, & Hamid (2020) revealed that outreach to curriculum implementation still needs to be done to align the perceptions of each teacher in implementing the curriculum. In addition, the results of teacher interviews found that schools did not develop learning materials so that the material presented was generalized to each student with different abilities and only focused on the material contained in government books. Meanwhile, the content of learning materials is also the key to this problem because it affects children's curiosity about the material they are studying. Supported by research conducted by Karaduman & Gultekin (2007) that teachers need to develop the material to be delivered because teaching materials determine student academic success from a cognitive aspect.

The objective condition of ASD students' reading ability provides an overview of prospective students who are expected to achieve the learning objectives of reading skills that have been formulated. Each student needs this analysis for mapping material, media, and evaluation. That way, students can get treatment according to their abilities and characteristics (Susan W. Whitea, et al., 2016). Research conducted by Andi & Arafah (2017) revealed that analyzing students' needs based on their abilities could provide important information about what should be taught and how to teach these skills.

The results of this study once again confirm that the AR-assisted personalized learning-based curriculum effectively improves ASD students' initial reading skills. Supported by research conducted by Shemshack & Spector (2020), this personalized learning model is suitable for children with special needs, ensuring that schools accommodate the needs of students with different needs, interests, and goals. The research results of Basham, Hall, Jr., & Stahl (2016) also support this finding that personalized learning provides enormous growth outcomes for students with special needs. In addition, the results of this study align with the findings of Rastegarmoghadam & Ziarati (2017) that the implementation of personalized learning is more effective with the use of technology to facilitate the organization of learning with a large number of students.

Conclusion

This research resulted in a personalized learning-based curriculum design assisted by AR in learning early reading skills for ASD students. Special Elementary School (SDLB) teachers can use this product to learn early reading skills by modeling interactive and communicative learning and taking into account the characteristics and abilities of ASD students. In developing the curriculum, it is necessary to refer to preliminary studies in the field and the principles of curriculum development. The use of instructional media also greatly influences students' interest and motivation to learn. However, still consider the availability of facilities and infrastructure

in schools. In the selection of learning media, the characteristics of students need to be considered so that learning objectives are achieved effectively.

Future research can be carried out in a preliminary study that explores teacher perceptions of student-centered learning. In addition, it allows for opportunities for research on aspects of advanced reading skills. The selection of learning media does not only use Augmented Reality but with other technologies that are by the characteristics of ASD students.

Recommendations

Although the study results showed an increase in reading ability of ASD students after using an AR-assisted personalized learning-based curriculum, this cannot be separated from the limitations in its implementation. First, the number of interview subjects (teachers) in this study was relatively small. Thus, teachers' views on learning are less varied. This has implications for what needs to be considered in developing this curriculum. In addition, the subjects of this study were relatively small, so they could not be used as generalizations for ASD students' initial reading skills. Second, the material provided needs to be expanded, so students do not feel bored and can explore more material. Third, everyday environmental factors, which are the family, need to be analyzed so students can improve their reading skills by studying independently at home.

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