

Development Of Interactive Learning Applications Based On Artificial Intelligence To Improve Early Childhood Literacy Skills At RA Darussalam 009

Nuraini Purwandari^{1*}, Taruna Nasution²

¹ Information Systems Research Program, Faculty of Computer Science, Institute of Business and Informatics Kosgoro 1957, Indonesia

² Information Systems, Science and Business Research Program, LIA University, Indonesia

* Coressponding Authors :

Email: nuraini.purwandari@gmail.com

Abstract .

Early childhood literacy skills are an important foundation in children's cognitive and academic development in the future. However, in RA Darussalam 009 it was found that conventional learning methods are still not optimal in stimulating children's interest and understanding of letters and words. This research aims to develop an interactive learning application based on artificial intelligence (AI) to improve early childhood literacy skills. The research method used is Research and Development (R&D) with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. The application is designed with voice recognition, image recognition, and automatic response features using simple Natural Language Processing (NLP) that are adjusted to the child's age. Testing was conducted on 25 children aged 4–6 years. The results of the research showed that the use of this application provided a significant increase in the ability to recognize letters, read simple words, and participate actively in the learning process. The results of this research indicate that AI technology can be effectively adapted in early childhood education environments to support fun, interactive, and adaptive learning to children's needs.

Keywords : Artificial intelligence; early childhood literacy; educational applications; interactive learning and RA Darussalam 009.

I. INTRODUCTION

Early childhood literacy skills are a crucial factor that determines cognitive, social, and academic development in the future. Literacy does not only include reading and writing skills, but also understanding, communication, and critical thinking [1]. Based on various studies, effective literacy learning must be carried out early so that children are better prepared to face higher levels of education. However, in many early childhood education institutions, learning methods are still conventional, less interactive, and have not been fully adapted to the development of individual children [2]. One of the main problems in literacy learning at RA Darussalam 009 is the low involvement of children in the learning process. Monotonous learning tends to make children quickly bored and less motivated to improve their reading and writing skills. In addition, limited manpower provides inspiration in providing personalized learning which is a challenge in itself. Children have different abilities and learning speeds, so a more adaptive method is needed to support their literacy development optimally.

The development of artificial intelligence (AI) technology opens up new opportunities in learning innovation, including in improving early childhood literacy. By utilizing AI, learning applications can be made more interactive and able to adjust the material based on the level of understanding of each child [3]. This technology also allows for the provision of real-time feedback, which can help children learn more effectively and enjoyably. However, until now, there has been little research that develops and implements AI in early childhood literacy learning, especially in educational environments such as RA Darussalam 009 [4]. This research aims to develop an interactive learning application based on artificial intelligence specifically designed to improve the literacy skills of early childhood at RA Darussalam 009. Specifically, the objectives of this research include:

- Analyzing the needs and challenges in early childhood literacy learning at RA Darussalam 009.

- Designing and developing AI-based applications that can adapt learning materials according to child development.
- Testing the effectiveness of applications in improving early childhood literacy skills through trials and evaluations with direct users.

This research has high urgency considering the importance of literacy as a basic skill in children's life and education. By utilizing AI technology, this research can produce innovations that not only increase the effectiveness of learning, but also make the learning process more fun and interesting for children[5]. Practically, the developed application can be used by teachers and parents as a tool to assist children in learning to read and write[6]. Academically, this research contributes to the development of technology-based learning models that can be applied in various early childhood education institutions[7]. Meanwhile, socially, this research can help address the gap in access to quality learning by providing more inclusive and adaptive solutions for children with various ability backgrounds. Thus, this research not only contributes to the world of education, but also supports the use of artificial intelligence technology to improve the quality of learning widely.

II. METHODS

This research uses the Research and Development (R&D) method with a prototyping approach to develop interactive learning applications based on artificial intelligence (AI). This method was chosen because it allows development iterations that directly involve users to ensure that the applications developed are in accordance with the needs of early childhood and teachers at RA Darussalam 009. This stage explains the steps in conducting research. The research flow diagram is shown in Figure 1.

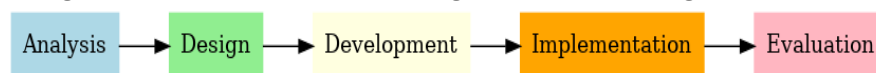


Fig 1. Flowchart of Research Steps

The research steps are carried out in several main stages:

1. System Analysis and Role
 - o Literature research related to AI-based literacy learning.
 - o Analysis of user needs (teachers, students, and parents).
 - o Designing the application system architecture, including the AI features to be used.
2. Development and Implementation
 - o Coding of artificial intelligence-based systems to adapt learning to child development.
 - o Integration of interactive features such as voice and image recognition to support literacy learning.
 - o Initial testing of the application in a simulated environment.
3. Testing and Evaluation
 - o Limited trial at RA Darussalam 009 with early childhood group.
 - o Evaluation of the effectiveness of the application in improving children's literacy through measurements before and after using the application.
 - o System improvements based on test results and user feedback.
4. Publication and Publication
 - o Application enhancements for wider implementation.
 - o Publication of research results in reputable journals.
 - o Registration of intellectual property rights (IPR) for the developed applications.

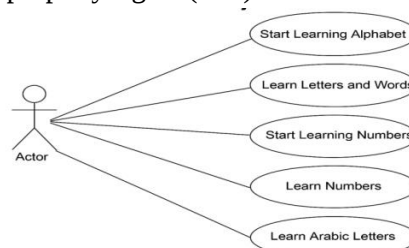


Fig 2. Usecase Diagram

The image is a UML Use Case Diagram of the *Suara Ceria Eja Pintar* application which illustrates the interaction between the main actors (in this case the user or child) with various main functional features in the system. Each use case shows the application's ability to provide interactive learning materials based on letters, words, numbers, and Arabic letters. This diagram shows that the entire process of using the application is user-centered, where users directly select and interact with the features they want to learn.

III. RESULTS AND DISCUSSION

From the results and discussion of this research, an application called *Suara Spell Ceria* has been produced which consists of three main features: *Learning the Alphabet*, *Learning Numbers*, and *Learning Arabic Letters*. Each module is designed to introduce young children to the basic symbols of literacy and numeracy in a fun way with interactive pronunciation methods.



Fig 3. Main Application View

Figure 3 shows the *Alphabet Learning* feature which allows children to recognize the letters A to Z and practice their pronunciation through a feedback system. The *Learn Numbers* feature teaches numbers 0 to 10, while the *Learn Arabic Letters* feature introduces hijaiyah letters using a similar method.

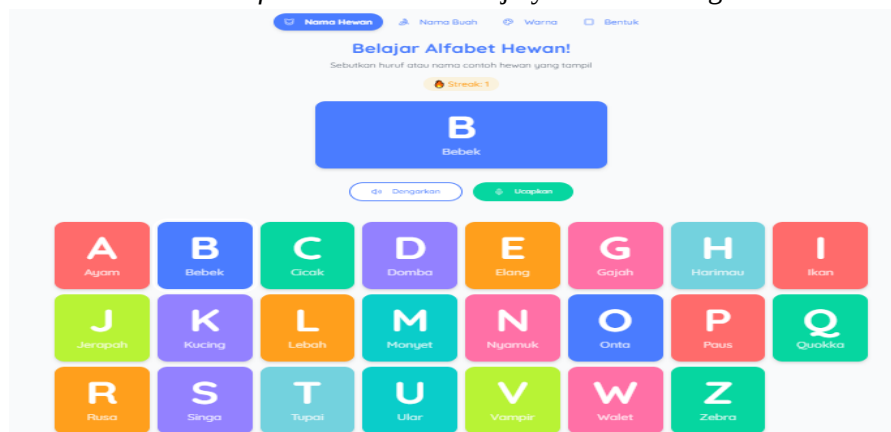


Fig 4. Animal Alphabet Learning Menu Display

Figure 4 shows the Animal Alphabet Learning feature of the *Suara Ceria Eja Pintar* application, which displays an alphabet learning approach combined with the introduction of animal names, a very effective strategy for young children. Each letter of the alphabet is displayed by a familiar animal name, such as "A" for Chicken, "B" for Duck, and so on up to "Z" for Zebra. This design not only introduces letters, but also enriches children's words through visual and verbal associations. The interactive features displayed, such as the "Listen" and "Pronounce" buttons, show that the application utilizes speech recognition technology to spread children's ability to pronounce letters or animal names correctly. Instant feedback, such as the star icon ("Sreak 1") that appears, provides additional motivation and creates a fun and challenging learning experience.

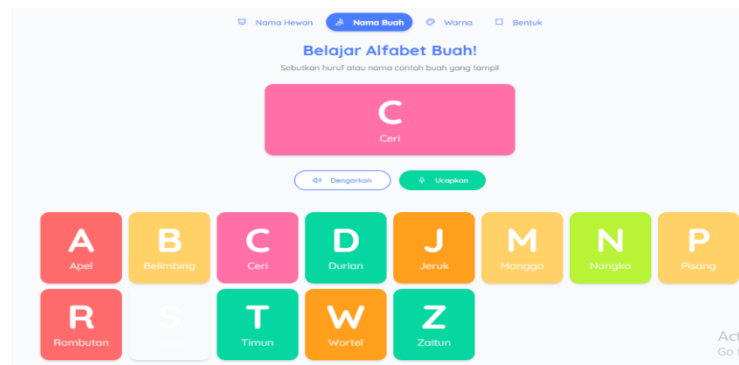


Fig 5. Display of the Fruit Name Alphabet Learning Menu

Figure 5 shows the Fruit Alphabet Learning feature in the Suara Ceria Eja Pintar application, displaying an interactive learning method that combines the introduction of alphabet letters with the names of fruits. In this display, the letter "C" is paired with the word "Ceri", and the child is given two interaction options: Listen and Say. This feature is designed to help children associate letters with real objects (in this case, fruit), thereby strengthening their visual and verbal memory.



Fig 6. Color Alphabet Learning Menu Display

Figure 6 shows the Learning Color Names feature of the Suara Ceria Eja Pintar application, displaying a visual learning approach that is very suitable for early childhood in recognizing the color spectrum. Children are presented with a clear and striking display of color cards, each labeled with the name of a color such as Blue, Red, Yellow, Green, Purple, and others, including variations such as Pink, Light Blue, and Lime. This contrasting and varied arrangement of colors helps children distinguish colors visually as well as recognize their names verbally.



Fig 7. Color Alphabet Learning Menu Display

Figure 7 shows the Learning Shapes feature of the Suara Ceria Eja Pintar application showing a simple yet effective visual approach to introduce the concept of basic shapes to young children. The four main shapes are displayed very clearly and in striking colors, namely: Square, Circle, Triangle, and Hexagon. Each shape is presented on a different colored card, with the shape icon and shape name written in large and easy to read letters. This approach is very useful in training children to recognize shapes through visual observation and verbal reinforcement.



Fig 8. Number Learning Menu Display

Figure 8 shows the Let's Learn Numbers! feature of the *Suara Ceria Eja Pintar* application, displaying an interactive and interesting basic numeracy learning method for early childhood. Children are introduced to the numbers 0 to 10 through brightly colored cards that are easy to distinguish and very visually appealing. When a number is selected, such as in the picture showing the number "0" with the pronunciation "Zero", the child can choose to *listen* or *hear* the number using the two interactive buttons available. This shows that the application utilizes speech recognition technology and audio feedback in supporting learning engagement.

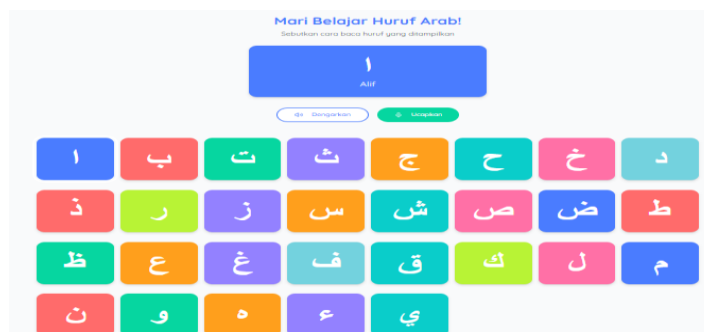


Fig 9. Arabic Language Learning Menu Display

Figure 9 shows the Let's Learn Arabic Letters feature from the *Suara Ceria Eja Pintar* application, displaying a very visual, interactive, and child-friendly approach to learning hijaiyah letters. Each Arabic letter is displayed in a strikingly colored box that attracts attention, accompanied by a pronunciation feature that is divided into two main buttons: Listen and Pronounce. In this image, the letter displayed is "ا" (Alif), and the child is directed to mention how to read the letter, so that learning includes visual, audio, and active pronunciation aspects.

IV. CONCLUSION

This research resulted in a *Suara Ceria Eja Pintar* Application that has been proven to be an effective interactive learning media in supporting the development of early literacy in early childhood. With features that include learning the alphabet, numbers, colors, shapes, and Arabic letters, this application presents a fun, adaptive, and multisensory learning approach. Each feature is designed with a child-friendly interface, using bright colors and responsive audio that increases interaction and learning motivation. The speech recognition technology applied also allows children to actively practice pronunciation independently and get direct feedback. The results of observations show that children show significant improvements in recognizing letter symbols, numbers, and other visual concepts using this application routinely. For further development, it is recommended that this application add a personalization feature based on the child's age or developmental level to adjust the level of difficulty of the material. In addition, integration with a reporting system for teachers and parents will be very helpful in uniting children's learning progress periodically. The addition of educational games based on challenges (gamification) and multilingual support can also expand the scope of users.

V. ACKNOWLEDGEMENTS

The author would like to express his deepest gratitude to all parties, especially the Principal of RA Darussalam 009, the Head of Institute of Business and Informatics Kosgoro 1957 and LIA University who have provided support and contributions in completing the research entitled "Development of Interactive Learning Applications Based on Artificial Intelligence to Improve Early Childhood Literacy Skills at RA Darussalam 009."

REFERENCES

- [1] K. Kisno, N. Fatmawati, R. Rizqiyani, S. Kurniasih, And Em Ratnasari, "Utilization Of Artificial Intelligences (Ai) Technology As A Positive Response Of Piaud Students In Learning Creativity And Digital Transformation," *Ijigaed Indones. J.Islam. Golden Age Education*, Vol. 4, No. 1, P. 44, 2023.
- [2] Conference, As Science, E. Setiawati, And Se Program, "Utilization Of Artificial Intelligence (Ai) Technology In Forming Students' Values And Characters In Ips," Vol. 01, No. 01, Pp. 388–394, 2024.
- [3] N. Purwandari And A. Fauzi, "Implementation Of Basic Technopreneurship For Early Childhood Education And Elementary School Teachers At The Cikarang District Level," Vol. 9, No. 1 August 2022.
- [4] N. Novitasari, "Entrepreneurship Skills In Early Childhood Education Teachers," *Al-Hikmah Indones. J. Early Childhood. Islam. Education.*, Vol. 3, No. 1, Pp. 70–87, 2019, Doi: 10.35896/Ijecie.V3i1.53.
- [5] F. Angellia, W. Cahya, R. Ramadhan, And I. Hariyansah, "Socialization Of The Use Of Virtual Meetings To Support Msme Business Activities During The Covid 19 Pandemic," *J. Pengabdi. Teratai*, Vol. 1, No. 2, Pp. 206–213, 2020, Doi: 10.55122/Teratai.V1i2.153.
- [6] B. Firmansyah, "Implementation Of Qr-Code Technology As A Room Data Search At Ibi Kosgoro 1957 Based On Android," *Junifjurnal Nas. Informasikan.*, Vol. 1, No. 1, Pp. 30–42, 2020.
- [7] S. Hidayat, W. Cahya, And H. Rifiyanti, "Technical Guidance On Digital Marketing Content Management At The Ahe Tanah Baru Tutoring Institute," Vol. 4, No. 2, Pp. 189–194, 2023. Silvanie, "... Business For Foster Parent Program Using Scrum, Bpmn And Complex Analysis: Case Research In Orangutan Foundation," *Junif J. Nas. Inform.*, Vol. 1, No. 1, Pp. 1–12, 2020
- [8] Fatoni, I. Setyawan, M. Rafli, And Fa Nugroho, "Improving Business Skills In The Marketplace For Muslim Women Of The Majelis Taqorrub Ilallah (Mti) Bekasi Through Digital Marketing Training," *J. Pengabdi. Teratai*, Vol. 2, No. 2, Pp. 114–123, 2021, Doi: 10.55122/Teratai.V2i2.310.
- [9] Dm Machdum And E. Ardianto, "Analysis Of Online Learning During The Covid-19 Pandemic In The Information Systems Department Of The Kosgoro 1957 Institute Of Business And Informatics," *J. Sist. Inf. Business*, Vol. 1, No. 2, Pp. 96–103, 2020, Doi: 10.55122/Junsibi.V1i2.177.
- [10] Arfa Syera, I., & Affiah, H. (2022). The Effect Of Third Party Financing And Funds On Total Assets In Sharia Financing Banks In Indonesia 2016-2020 Period. *International Journal of Science, Technology & Management*, 3(5), 1268-1275. <https://doi.org/10.46729/ijstm.v3i5.626>
- [11] Butarbutar, M., Kurnia Lubis, A., Tua Siregar, R., & Supitriyani, S. (2022). Implementation Of Work Stress In Moderating Work-Life Balance And Flexible Work Arrangements For Job Satisfaction During The Covid-19 Pandemic. *International Journal of Science, Technology & Management*, 3(5), 1357-1364.
- [12] Evanthi, A., & Mukti Azhar, R. (2023). Planning and Implementation of Event Marketing in Sociopreneurship . *International Journal of Science, Technology & Management*, 4(6), 1451-1459.
- [13] Nugraha, B., Sianturi, I., & Aini Rakhman, R. (2023). The Effect Of Supply Chain Management And Corporate Communication Skills On Production Performance At PT. Berlian Manyar Sejahtera. *International Journal of Science, Technology & Management*, 4(6), 1477-1485. <https://doi.org/10.46729/ijstm.v4i6.966>.
- [14] Parulian Simanjuntak, G., & Sensi W, L. (2023). Evaluation Of The Implementation Of The Internal Audit Capability Model (IACM) Level 3 In The Supervision System Of The Inspectorate General Of The Ministry Of Agriculture. *International Journal of Science, Technology & Management*, 4(6), 1581-1602.
- [15] Hanif Triyana, M., & Indah Fianty, M. (2023). Optimizing Educational Institutions: Web-Based Document Management . *International Journal of Science, Technology & Management*, 4(6), 1653-1659.