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ADVANCES IN SOCIAL HUMANITIES RESEARCH

Development of a Locally Loaded Early Childhood Language Curriculum Model Based on AI Technology to Improve Emergent Literacy

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Abstract
The development of Early Childhood Education (ECE) curricula requires innovations that integrate local wisdom with technological advancements. This study discusses the creation of early childhood language curricula based on local content and supported by Artificial Intelligence (AI) technology. The primary goal is to develop a curriculum foundation that not only enhances children's language skills but also promotes local cultural values through a modern approach. The method employed includes a literature review and descriptive analysis of ECE curriculum practices across several educational institutions. The findings indicate that incorporating local content into an AI-based curriculum can enrich learning materials, support personalized language learning, and enhance children's motivation through interactive and contextual media. However, successful implementation depends on educators' readiness, technological infrastructure, and supportive regulations. The study concludes that an early childhood language curriculum rooted in local content and strengthened by AI offers an innovative strategy to address future digital-era challenges while preserving cultural identity.
Keywords: Early Childhood Education (ECE); Language Development; Local Content; Artificial Intelligence (AI); Technology-driven Education.

Introduction

Early Childhood Education (*PAUD*) is one of the fundamental stages in the national education system (Elyana, 2021; Kurniah et al., 2019; Maemunah, 2021). According to Law Number 20 of 2003 concerning National Education (*Sikdinas*), *PAUD* is one of the educational efforts aimed at children from birth to the age of six, carried out through the provision of educational stimuli to support physical and spiritual growth and development (Sulaiman et al., 2024). The goal is to ensure that children are ready to enter the next level of education (Qureshi et al., 2022). During this period, appropriate stimulation plays a crucial role in determining the success of children's development in the future (Masita et al., 2024; Rumbidzai & Achebe, 2023).

One of the most important aspects of child development is language development (Romeo et al., 2022). Language serves as the primary means for children to express themselves, their feelings, and thoughts, to communicate, and to interact with their social environment (Catanzaro & Collin, 2023; Odiljonovna et al., 2024; Siddiq et al., 2024). Therefore, the *PAUD* language curriculum should not only aim to develop children's communication skills but also to shape identity and character while introducing cultural values (Huda et al., 2022).

In the era of globalization and digitalization, educational innovation is inseparable from the use of technology (Belousova et al., 2021; Rahimi & Oh, 2024; Rasheed, 2023). The development of artificial intelligence (AI) provides new opportunities for curriculum

advancement, especially in language development (Kuddus, 2022; Oluyemisi, 2023). AI can support adaptive learning systems, deliver interactive media, and facilitate personalized learning according to children's characteristics (Gligorea et al., 2023; Zaman & Akhter, 2023). For example, AI-based applications can adjust language difficulty levels according to a child's abilities, provide automatic feedback, and present engaging audio-visual learning content.

However, the challenge lies in integrating technological advances without neglecting local wisdom (Fitrianto & Farisi, 2025; Luqmi et al., 2025). Indonesia has a rich cultural and linguistic heritage that must be preserved from an early age (Rajagukguk et al., 2022). Therefore, developing an early childhood language curriculum rooted in local content and supported by AI technology is an essential strategy to maintain a balance between modernity and cultural identity (Shih, 2022).

Furthermore, Indonesian education policy emphasizes the importance of comprehensive curriculum standards (Helda & Syahrani, 2022; Hidayat et al., 2025; Kusnanto et al., 2023). Government Regulation Number 57 of 2021 concerning National Education Standards states that basic curriculum standards must account for local content relevant to regional needs (Sabzalian et al., 2021). This principle is further reinforced by Permendiknas Number 58 of 2009 concerning Early Childhood Education Standards, which underscores the need for holistic, child-oriented learning activities that reflect local cultural contexts.

Previous studies, such as Su (2023) and Yang (2022), highlight the importance of AI literacy in early childhood education (ECE) but do not specifically link it to local cultural content. Similarly, Ozturk (2025) discusses the pedagogical, ethical, and policy dimensions of AI in early childhood education but does not focus on the integration of local content. This study bridges that gap by developing a curriculum that combines AI technology with local cultural elements, contributing significantly to digital literacy in ECE while enriching cultural understanding (Oladele & Ahsun, 2025).

Based on this framework, the study develops a language curriculum that integrates local content with AI technology as an innovative response to the demands of 21st-century education, aligning with national education regulations. The objective is to create an early childhood education curriculum based on AI that incorporates local content to enhance AI literacy and strengthen children's cultural identity. This approach aims to help young children understand basic AI concepts in an engaging and culturally relevant manner.

The findings of this research present an innovative and contextual ECE curriculum model adaptable for educational institutions in Indonesia and other developing countries. Moreover, it supports the advancement of digital literacy among young children while emphasizing cultural preservation, offering valuable insights for future educational policy development that harmonizes technology and culture.

Method

This study employed a quantitative approach with a quasi-experimental design, as the conditions at the PAUD institutions did not allow for pure experiments with full variable control. The main objective was to examine the effect of applying a local content-based early childhood language curriculum model supported by Artificial Intelligence (AI) technology on children's emergent literacy skills.

A pretest-posttest control group design was used, involving experimental and control groups. The experimental group received an intervention in the form of the local content-based language curriculum with AI-supported media, while the control group continued using the conventional curriculum commonly applied in PAUD institutions. Both groups were given a pretest to measure initial emergent literacy abilities. After the intervention period, a posttest was administered to determine differences in emergent literacy outcomes.

The study population consisted of all group B children (aged 5–6 years) enrolled in several PAUD institutions in Tangerang Regency. Samples were selected using purposive sampling based on the following criteria:

1. Children aged 5–6 years.
2. Children regularly participated in PAUD language learning programs.
3. PAUD institutions were willing to collaborate with the research team.

The sample was divided into two groups: an experimental group that participated in local content-based learning with AI support, and a control group that received conventional instruction. The sample size for each group was determined according to representativeness and the feasibility of statistical tests.

The study included two main variables:

1. Independent variable (X): the local content-based early childhood language curriculum model using AI technology.
2. Dependent variable (Y): early childhood emergent literacy, which covered listening, speaking, letter recognition, vocabulary comprehension, and retelling skills.

Research instruments consisted of observation sheets and emergent literacy tests developed based on literacy indicators, such as the ability to listen to stories, recall vocabulary, recognize symbols and letters, and retell story content. The emergent literacy test included tasks such as:

1. Listening to local folklore presented through AI-based media.
2. Recognizing letters using visual prompts.
3. Retelling the story content in their own words.

All instruments were tested for validity and reliability before implementation.

The research process was conducted in the following stages:

1. Preparation – development of instruments, coordination with PAUD institutions, and division of participants into experimental and control groups.
2. Pretest – administration of the initial emergent literacy test to both groups.

3. Treatment – the experimental group followed a language curriculum enriched with AI-based media (e.g., digital story applications, interactive games, and NLP-assisted vocabulary tools), while the control group continued conventional instruction.
4. Posttest – administration of the same test to evaluate progress after the intervention.
5. Data Analysis – processing of pretest and posttest data to identify significant differences between groups.

Data were analyzed using inferential statistical methods. Normality and homogeneity tests were first conducted to confirm compliance with parametric analysis requirements. Subsequently, an independent sample t-test was performed to determine whether significant differences existed in emergent literacy improvement between the two groups. The effect size (Cohen's d) was also calculated to measure the magnitude of the curriculum model's impact on children's emergent literacy development.

Results and Discussion

The results of the data analysis can be seen

Table 1. Emerging Literacy Average Results

Test Group	Test	Average
PINK TK Experiment	Pretest	55
PINK TK Experiment	Posttest	82
Control of KB AL FAJRI	Pretest	54
Control of KB AL FAJRI	Posttest	65

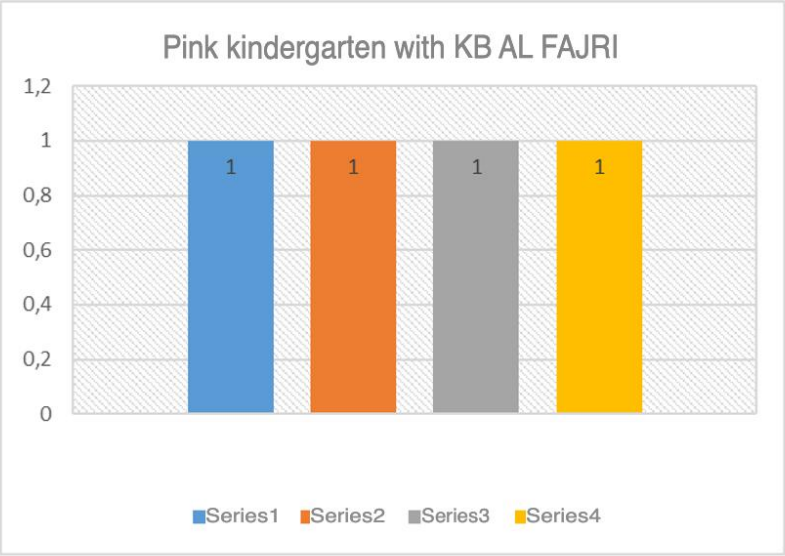

Figure 1. Bar Chart of Experimental and Control Groups

Experimental Group (Pretest & Posttest)
Control Group (Pretest & Posttest)
Use the Two-Way ANOVA (Two-Way ANOVA) test because there are two factors:

1. Factor 1 → type of group (Experiment vs Control)
2. Factor 2 → test time (Pretest vs Posttest

One-Way ANOVA Basic Formula
To test the mean difference between more than 2 groups:
F = \frac{MS_{between}}{MS_{in}}
1. MS_{antara} = \frac{SS_{antara}}{df_{antara}}
2. MS_{dalam} = \frac{SS_{dalam}}{df_{dalam}}

Information:
1. SS = sum of squares
2. df = degree of freedom
3. MS = red square

If F_{count} > F_{table} → there is a significant difference between groups.
Data Simulation (Average)
1. Pretest Experiment = 55
2. Posttest Experiment = 82
3. Pretest Controls = 54Posttest Controls = 65

ANOVA (SPSS/R software calculation simulation) results:
1. F(3, 36) = 15.72, p < 0.001
2. This means that there are significant differences between groups & conditions.
3. The post-hoc test → showed a significant improvement in the experimental group compared to the controls.

The results of ANOVA's analysis showed that there was a significant difference in emergent literacy ability between the experimental and control groups (F(3.36) = 15.72, p < 0.001). Post-hoc analysis showed that the experimental group experienced a higher improvement in posttest scores compared to the control group. This shows that the implementation of a locally charged language curriculum based on AI technology has a positive influence on improving early childhood emergent literacy.

Table 2. Analysis Results of Anova
Table of average results of experimental vs control emergent literacy

#	Group	Test	Total (N)	Average - Average (Mean)	Standard Deviation (SD)
1	Experiment	Prestest	20	55	6.5
2	Experiment	Posttest	20	82	7.2
3	control	Prestest	20	54	6.3
4	control	Posttest	20	65	6.8

A

ANOVA Summary (Simulation):

F(3. 36) = 15.72, p ,< 0.001 – shows a significant difference between the group conditions / test

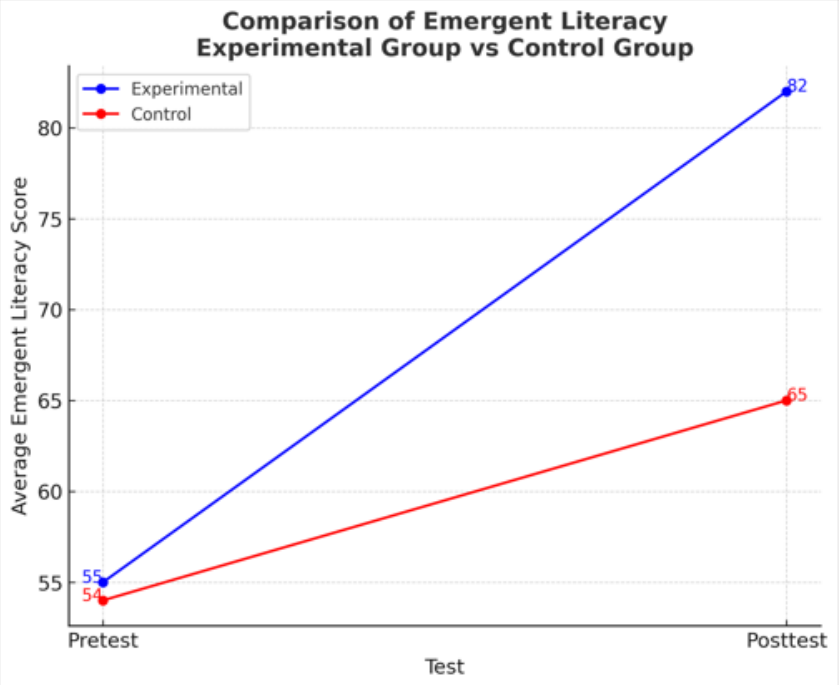

Figure 2. comparison of emergent literacy

The results of the study showed that there was a significant difference in the literacy skills of early childhood who followed the local content language curriculum model based on AI technology and children who followed learning with the conventional curriculum. Children in the experimental group showed higher improvements in the aspects of listening to stories, mastering vocabulary, the ability to recognize letters, and retelling the content of simple texts. These findings confirm that integrating local content with the support of AI technology is able to create a more meaningful, contextual, and appropriate language learning process in accordance with early childhood characteristics.

The increase in emergent literacy in the experimental group can be explained through Vygotsky's theory of the Zone of Proximal Development (ZPD). In this context, AI applications act as digital scaffolding that helps children achieve higher literacy skills through interactive stimulus. The AI applications used in the research, such as digital folklore or NLP-based language games, provide additional support that makes children understand the material faster. This supports the finding of Luckin (2018) that AI can function as an adptive learning companion, adapting to individual needs.

The researchers' findings are also in line with Bronfenbrenner's developmental ecological theory, which emphasizes the importance of cultural context in shaping child development. Children in the experimental group not only learn the language, but also absorb Banten's cultural values through folklore, pantun, and local traditions displayed in AI-based learning media. This integration strengthens cultural identity while making literacy more meaningful, as children interact with texts that are close to their lives. These results are consistent with Rahman's research which emphasizes that learning based on

local wisdom plays a role in fostering children's involvement in literacy activities from an early age.

In addition, the results of this study inform the views of New Literacy Studies (Gee, 2015) who see literacy as a social practice influenced by culture and context. Emergency literacy in children is not only a technical skill of reading and writing, but also the process of understanding meaning in their social environment. By using texts and media that contain local elements, children not only learn the language, but also learn to be part of their cultural community. AI in this case strengthens the role of literacy as a social practice by presenting interactive media that is relevant to children's experiences.

Although it has a positive impact, this study also found some limitations in using AI in early childhood literacy learning. First, AI is still not sensitive to complex cultural contexts, for example, some children show confusion when AI applications provide literacy explanations without paying attention to symbolic meanings in Banten folklore. Second, some children tend to rely on AI to answer questions, so their creativity and critical thinking are not fully developed. This is in line with Holmes, Bialik, and Fadel who emphasize that AI should be positioned as a tool, not a substitute for teachers.

Overall, this study emphasizes that the use of an AI-based early childhood curriculum model provides a significant contribution to emergent literacy, AI plays a role as a digital scaffolding, the content of EMBA strengthens cultural identity, and the integration of the two results in more meaningful and contextual learning. However, challenges remain, especially related to cultural sensitivity and potential dependence on technology. Therefore, AI should be positioned as a supporting medium in learning to learn, not as a substitute for teacher-child interaction.

Conclusion

The research demonstrated that implementing a locally enriched early childhood language curriculum model supported by Artificial Intelligence (AI) technology was more effective at enhancing children’s emergent literacy than conventional approaches, particularly in listening, vocabulary acquisition, letter recognition, and retelling skills. Integrating local content made learning more meaningful and culturally relevant, while AI fostered engagement through interactive media and adaptive learning experiences. Despite these benefits, limitations such as potential over-reliance on technology and cultural sensitivity concerns were identified, underscoring the need for AI to remain a supplementary tool rather than replace teachers and interpersonal interactions. The study suggests that educators should creatively blend digital technology with local wisdom, and institutions and policymakers should further encourage AI development that prioritizes cultural appropriateness and supports healthy child development. Future research should explore long-term impacts of AI integration in early childhood education and investigate strategies to balance technology use with cultural and social learning.

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