JURNAL PENDIDIKAN USIA DINI
2026, VOL. 20, NO. 2, 240-249
e-ISSN (Online Media): 2503-0566
P-ISSN (Print Media): 1693-1602
http://journal.unj.ac.id/unj/index.php/jpud

Development of Innovative Learning Media 'Jam Genius' to Improve Speaking Skills of Children Aged 4–5 Years

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ABSTRACT
This research is motivated by the suboptimal stimulation of speaking skills among children aged 4–5 years in Early Childhood Education (ECE) learning practices, which tend to remain teacher-centered and involve limited use of interactive media to support children's verbal interactions. This study aims to: (1) develop the innovative Jam Genius learning media, which is suitable for improving children's speaking skills; and (2) examine the effectiveness of its use among children aged 4–5 years. This study employed a Research and Development (R&D) approach by adapting the ADDIE model, which consists of five stages: analysis, design, development, implementation, and evaluation. The research subjects consisted of two expert validators, two teachers, and 21 children aged 4–5 years from two Early Childhood Education (ECE) institutions in Kendari City. Data were collected through observation, interviews, questionnaires, and documentation, and were analysed using both quantitative and qualitative methods. The testing results indicated that the media was categorized as suitable based on validation by media and content experts, as well as user perceptions. The effectiveness test using the Mann–Whitney U test showed a significant difference in children's speaking skills between the experimental and control groups (Asymp. Sig. = 0.000 < 0.05). The results showed that the Jam Genius learning media can integrate numerical elements, colours, and contextual themes with speaking stimulation activities, thereby improving children's confidence in speaking, vocabulary mastery, ability to construct simple sentences, and participation in conversations.

Artikel HISTORY
Submition 21 July 2026
Received 3 October 2026
Accepted 12 October 2026

KEYWORDS
Learning Innovation, Jam Genius Media, and Speaking Skills.

DOI. 10.21009/jpud.v20i2.70760

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1. Introduction

Early Childhood Education (ECE) serves as a strategic foundation for human resource development, as emphasized in Sustainable Development Goal (SDG) Target 4.2, which highlights the importance of access to quality preschool education. The quality of education and care services during early childhood is a key determinant in establishing the foundation for lifelong learning and sustainable development (Alpys & Hernandez-Torrano, 2025). In Indonesia, Early Childhood Education (ECE) policies are directed toward the holistic stimulation of children's developmental aspects, including language as a foundation for literacy and communication. The age of 4–5 years is a critical phase in language development, characterized by an expanding vocabulary, the ability to construct simple sentences, and active participation in social conversations.

Empirical studies have shown that structured language stimulation and meaningful interaction significantly contribute to children's speaking skills (Brofman et al., 2020; Vallotton & Ayoub, 2011). However, previous studies have shown a predominance of digital media and interactive storybooks in supporting children's language development (Shukran et al., 2024; Solichah & Fardana, 2024a; Rizky Amalia & Destiana,

2025). Meanwhile, the development of physical manipulative media that systematically integrates visual elements, numeracy, and language stimulation remains limited. This research gap highlights the need for innovative learning media that not only focus on introducing concepts of time or numbers but also provide dialogic, participatory, and contextualized learning experiences.

Field observations indicate that Early Childhood Education (ECE) learning practices tend to remain teacher-centered, with a heavy reliance on children's worksheets and limited opportunities for spontaneous speaking. This condition has resulted in children not yet achieving the language development indicators outlined in the Standards for the Achievement of Child Development Levels (SACDL). The pedagogical urgency lies in providing learning media that can shift instructional practices toward a child-centered approach through communicative play activities.

The novelty of this study lies in the development of the innovative Jam Genius, a manipulative analog clock that integrates numbers, colors, and animal-themed elements with speaking stimulation activities. Unlike conventional educational clock media, the Jam Genius is designed as a dialogic medium that encourages children to name vocabulary, imitate sounds, construct simple sentences, and retell information based on visual stimuli. The benefits of the Jam Genius are twofold: pedagogically, it enhances the quality of enjoyable and participatory learning interactions, while empirically, it has been shown to improve young children's confidence in speaking, vocabulary mastery, and participation in conversations.

Furthermore, this study provides a practical contribution to Early Childhood Education (ECE) policy in Indonesia by presenting empirical evidence that non-digital manipulative media can serve as a strategic alternative for supporting language learning. This is in line with national policy directions that emphasize the importance of learning based on concrete experiences, interactive activities, and approaches that are appropriate to children's developmental characteristics. Thus, the Jam Genius not only addresses the research gap but also offers an implementable solution for ECE teachers to improve the quality of language stimulation for young children.

2. Method

This study employed a *Research and Development* (R&D) approach to develop the innovative Jam Genius learning media. This study adapted the ADDIE model developed by Dick and Carey (I Made Tegeh, 2014), which consists of five stages: *Analysis, Design, Development, Implementation, and Evaluation*.

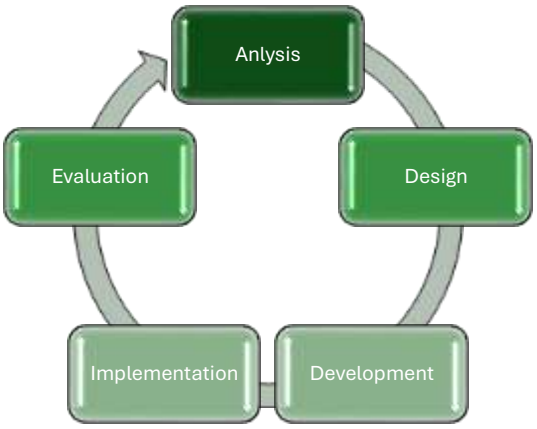


Figure 1. **ADDIE Development Model**

Data in this study were collected using several techniques, namely observation, interviews, questionnaires, and documentation. The sampling technique used was purposive sampling, taking into consideration specific criteria relevant to the objectives of the study. The research subjects consisted of two validators (a media expert and a content expert), two teachers, 13 children from Indah Lestari Kindergarten, and 8 children from Insantama Kindergarten in Kendari. All participating children were aged 4–5 years.

The collected data were analysed into two categories: quantitative and qualitative data. Quantitative data were obtained from observation sheets. Observations were conducted to assess improvements in children's speaking skills before and after the use of the Jam Genius learning media. Furthermore, questionnaire responses were used to assess the feasibility of the innovative Jam Genius learning media. The assessment

scale ranged from 1 to 4, with 1 indicating "not feasible" and 4 indicating "highly feasible." The media validation questionnaire was administered to two validators, consisting of a media expert and a content expert. The media validation instrument contained 24 statement items, with a maximum score of 96, while the content validation instrument consisted of 21 statement items, with a maximum score of 84.

Meanwhile, qualitative data were obtained through interviews and documentation. Interviews were conducted to obtain preliminary information regarding children's language development and teachers' responses to the use of the media. Documentation was carried out to collect, organize, and select various relevant information and supporting evidence related to the implementation of the study.

Table 1. Conversion of Quantitative Data into Qualitative Data

Score	Score Interval	Criteria
5	X ≥ Xi + 1,80 Sbi	Highly Feasible
4	Xi + 0,6 Sbi <X ≤ Xi + 1,80 Sbi	Feasible
3	Xi – 0,60 Sbi <X ≤ Xi + 0,60 Sbi	Moderately Feasible
2	Xi – 0,80 Sbi <X ≤ Xi – 0,60 Sbi	Less Feasible
1	X ≤ Xi – 1,80 Sbi	Highly Infeasible

Description:

Xi = $\frac{1}{2}$ $(Highest\ Score\ +\ Lowest\ Score)$

Sbi = $\frac{1}{6}(Highest\ Score -\ Lowest\ Score)$

3. Result and Discussion

The aim of this study is to develop the innovative Jam Genius learning media to improve the speaking skills of children in Kindergarten A (Group A) at a kindergarten in Mokoau Village, Kendari City. The findings are presented and discussed in several sections.

3.1. Needs Analysis as the Basis for Media Development

A needs analysis was conducted as an empirical foundation for the development of the innovative Jam Genius learning media, which is designed to improve the speaking skills of children aged 4–5 years. This stage aimed to identify the actual conditions of learning practices, the gap between children's language development standards and practices in the field, as well as the specific needs of teachers and learners for relevant and contextualized learning media. The analysis was conducted through classroom observations, teacher interviews, a review of learning documents, and the distribution of a needs assessment questionnaire to Group A classroom teachers at two Early Childhood Education (ECE) institutions in Kendari City.

The observation results showed that language learning activities in the classroom were still dominated by the use of Children's Worksheets (CW) and fine motor activities, while speaking skills were not yet optimally stimulated. Learning interactions tended to be one-way, with teachers serving as the primary source of information and children as passive recipients. Opportunities for children to express their ideas, answer open-ended questions, or verbally share their experiences remained limited. This condition resulted in low levels of children's verbal participation during learning activities. These findings were further supported by interviews with teachers, who reported that they often experienced difficulties in designing activities specifically aimed at stimulating children's speaking skills. Teachers tended to focus on completing thematic learning targets and written activities, while oral language development had not yet been systematically integrated into the learning media used. In addition, the limited availability of interactive media capable of eliciting children's verbal responses was identified as one of the main obstacles to effective learning.

Document analysis of the curriculum, Lesson Plans (LP), and textbooks showed that language learning objectives had been formally included; however, their implementation had not yet fully addressed the achievement of speaking development indicators for children aged 4–5 years. Based on the standards for the achievement of child development levels, children in this age range are expected to be able to follow two instructions simultaneously, answer simple questions, express their opinions, and retell experiences or information they have heard. However, field observations showed that some children still experienced difficulties in constructing simple sentences coherently and speaking confidently in front of their peers. The gap between developmental standards and learning practices indicates the need for innovative media specifically designed to encourage children's active language production. The media previously used did not fully provide visual and contextual stimuli capable of eliciting spontaneous verbal interactions. Therefore, the development

of learning media needs to be grounded in actual classroom needs rather than merely focusing on the administrative completeness of learning materials.

The results of the needs assessment questionnaire administered to teachers indicated a high level of urgency for the development of more interactive language learning media. Overall, the mean needs score fell within the "highly important" category. Teachers stated that learning media incorporating the introduction of letters, syllables, vocabulary, and simple sentences are highly needed to help children develop their speaking skills. In addition, the integration of visual elements, such as bright colors, concrete images, and themes closely related to children's everyday lives, was considered important for increasing their attention and learning motivation. In this regard, the animal theme emerged as one of the most preferred themes and was considered relevant for incorporation into the learning media. The theme was regarded as contextual, easily recognizable by children, and highly suitable for developing storytelling activities, simple dialogues, and role-playing games. Teachers also emphasized the importance of appropriate font size, clear images, and safe materials to ensure that the media can be used comfortably by young children.

Based on the synthesis of these qualitative and quantitative findings, several key needs for the development of speaking learning media were identified, namely: (1) media that can encourage children's active verbal participation; (2) integration of visual elements, numbers, and simple stories; (3) the use of contextual themes that are closely related to children's experiences; (4) an attractive, safe, and developmentally appropriate design for children aged 4–5 years; and (5) user guidelines that facilitate teachers in promoting two-way interaction.

These findings served as the conceptual foundation for designing the innovative Jam Genius learning media. The media was developed in the form of an interactive analog clock that combines numbers 1–12 with animal images and simple stories as stimuli for speaking activities. Each number selected by the child leads to a specific verbal activity, such as naming an animal, imitating its sound, constructing simple sentences, or retelling the content of a short story. The integration of visual elements, play, and oral activities is designed to create an enjoyable learning experience which meaningfully stimulating language development. This analysis also confirms that needs-based innovation in learning media is an important strategy for systematically and purposefully enhancing the quality of speaking skills stimulation in early childhood.

3.2. Design and Characteristics of the Innovative Jam Genius Media

The Jam Genius media was designed as a response to the ned for speaking instruction that combines visual elements, play-based activities, and active language stimulation. Conceptually, this media was developed in the form of an interactive analog clock that combines number recognition and basic concepts of time with oral language development activities. The design is intended to provide a multimodal and contextual learning experience that encourages the active participation of children aged 4–5 years. Structurally, the Jam Genius is designed as a child-safe clock board appropriate for young children, featuring numbers 1–12 and brightly colored animal illustrations. Each number serves as a prompt for a specific verbal activity. When children move the clock hand and point to a particular number, the teacher facilitates the planned speaking activities, such as naming vocabulary, imitating sounds, constructing simple sentences, and retelling a short narrative. This approach transforms play into a structured learning medium with clear pedagogical objectives.

This media integrates four main components: visual, numerical, narrative, and language activity aspects. Concrete visual representations and the use of contrasting colors are employed to attract children's attention while reinforcing their understanding of meaning. The numerical aspect serves not only to introduce numbers but also to organize the sequence of speaking activities. The narrative component is presented through simple stories appropriate to children's language development stages, with the aim of enriching vocabulary and developing their ability to construct sentences. The language activities are designed in a variety of ways to encourage active verbal production and two-way interaction. The innovative advantage of this media lies in its integration of multiple developmental domains within a single manipulative learning tool. The Jam Genius does not separate numeracy and language learning; rather, it integrates both within a symbolic play context that is appropriate for the characteristics of the preoperational stage. Its rotatable and tactile design also supports fine motor engagement while maintaining children's concentration during learning activities.

Thus, the Jam Genius functions not only as a visual aid but also as a structured and contextualized language stimulation system based on analog clock play. This design provides a strong implementation foundation for enhancing children's verbal participation and the quality of learning interactions in early childhood education. The design of the Jam Genius at this stage is presented in Figure 2 below.

Figure 2. Initial Design of the Jam Genius



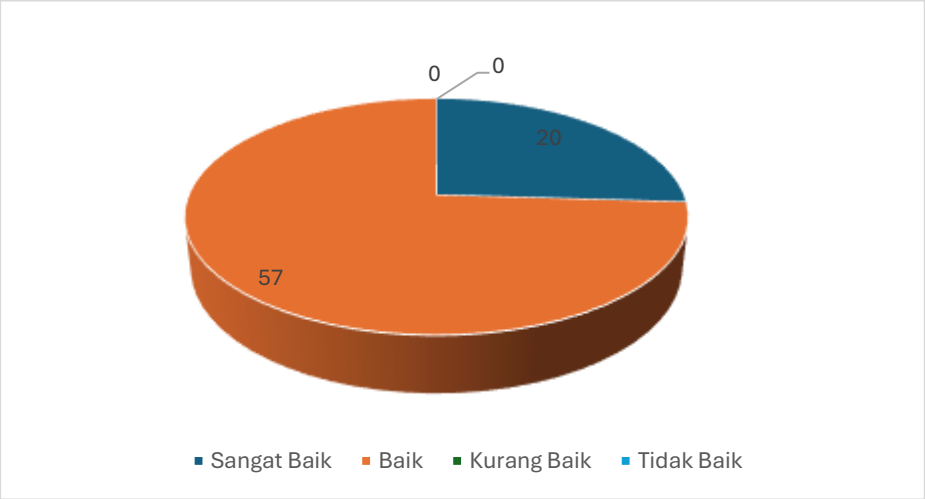
3.3. Development of the Jam Genius

The development of the media was based on the experts' review of the materials used in the development process. The results of the validation of the innovative Jam Genius media are presented as follows.

a. Validation of the Innovative Jam Genius Media

The media validator's assessment focused on two main aspects: media design and learning. The media design aspect included the attractiveness of the media, its physical appearance, and the combination of colors and images. Meanwhile, the learning aspect covered the suitability of the media for the children's learning environment, the completeness of the media components, the integration of the media's functions with the learning objectives, its suitability for the characteristics of the learners, and its ease of use. Based on these aspects, the media was rated as "feasible" in terms of both design and material suitability, with engaging and varied content that supports children's attention and focus during learning activities. This finding is consistent with Sweller (1988), who stated that the combination of colors and images should support children's understanding and attention rather than merely serve as decoration. The results of the media validator's assessment are presented in Figure 3.

Figure 3. Results of the Media Validator's Assessment



Based on the data presented in Figure 3, a further analysis of the quantitative data was conducted. The results of the quantitative data analysis are presented as follows.

Table. Results of the Quantitative Data Calculation for Media Validation

Assessment Aspects	X	Xi	Sbi
24 items	77	60	12

Based on these calculations, it can be concluded that the obtained score (X) was 77, while the ideal mean score (Xi) was 60, and the ideal standard deviation (Sbi) was 12. The resulting score represents quantitative data, which was subsequently converted into qualitative data using the conversion table presented in Table 1. The results of the conversion are presented as follows.

Xi+0,6 *Sbi*<X≤ Xi + 1,80 Sbi
60+0,6*12<77≤ 60 + 1,80*12
67,2<77≤81,6

Based on these calculations, the assessment by the content expert falls within the score interval of Xi + 0.6 Sbi < X ≤ Xi + 1.80 Sbi and is categorized as "feasible."

b. Content Validation of the Innovative Jam Genius Media

The content expert's assessment of the innovative Jam Genius media focused on two main aspects: content completeness and alignment with the learning objectives. The content completeness aspect included the components required for speaking instruction, while the alignment with learning objectives aspect covered the breadth and accuracy of the content, the relevance between the content and the media, the appropriate use of language conventions, and the attractiveness of the content, and the suitability of the content with for children's characteristics in this assessment was categorized as "feasible." because the media integrates basic vocabulary content with simple stories that provide feedback and support children's language development. This is consistent with the view of Mayer and TPACK (2009), which states that learning media should support development in accordance with children's age and abilities. The total number of assessment items was 21. The results of the content validation of the innovative Jam Genius media are presented in Figure 4.

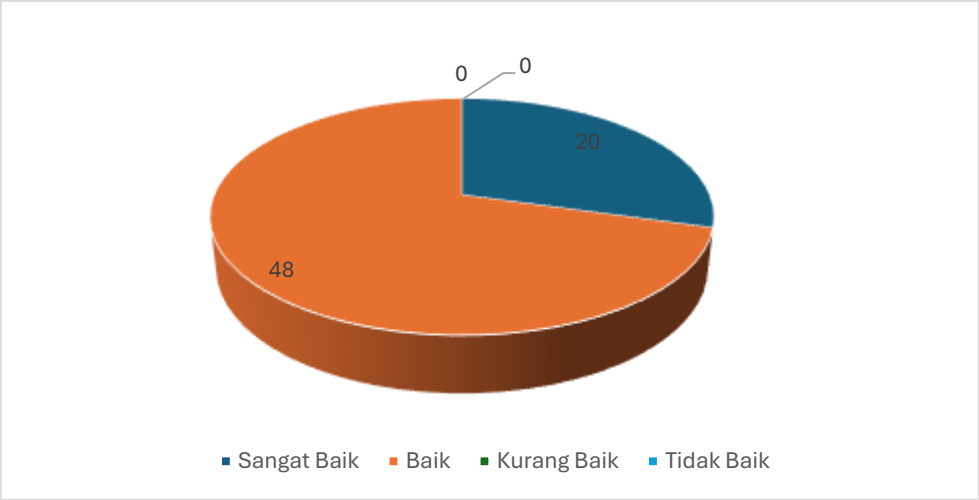


Figure 4. Results of the Content Validator's Assessment

Based on the data presented in Figure 4, a further analysis of the quantitative data was conducted. The results of the quantitative data analysis are presented as follows.

Table. Results of the Quantitative Data Calculation

Content Validator	X	Xi	Sbi
21 item pertanyaan	68	52,5	10,5

Based on these calculations, it can be concluded that the obtained score (X) was 68, while the ideal mean score (Xi) was 52.5, and the ideal standard deviation (Sbi) was 10.5. The results of these score calculations represent quantitative data, which were subsequently converted into qualitative data based on the conversion table presented in Table 1. The results of the conversion are presented as follows.

Xi+0,6 *Sbi*<X≤ Xi + 1,80 Sbi
52,5+0,6*10,5<68≤ 52,5 + 1,80*10,5
58,8<68≤71,4

Based on these calculations, the assessment by the content expert falls within the score interval of Xi + 0.6 Sbi < X ≤ Xi + 1.80 Sbi and is categorized as "feasible."

c. Revision of the Innovative Jam Genius Media Product

The validators not only provided quantitative assessments but also offered suggestions for improving the learning media to enhance the speaking skills of children in Class A. Another important point emphasized was that the learning media should be adapted to the concepts and abilities of children aged 4–5 years, while the language components within the animal theme should be integrated into the innovative Jam Genius media to facilitate children in constructing their own knowledge through play-based activities, as stated by Vygotsky (1978) that physically engaging media, including colors, images, and manipulable elements, functions as a tool for constructing knowledge through play-based activities and collaboration. After two rounds of revisions by the media and content experts, the improved physical structure of the learning media was obtained, as shown in Figure 5 below



Figure 5. Results of the Revision of the Innovative Jam Genius Media Product

3.4. Implementation of Media in Learning

The implementation stage was carried out after the innovative learning media, Jam Genius, was declared feasible based on the results of validation by media and subject matter experts. The validation results indicated that the media fell within the "feasible" to "highly feasible" categories, based on the combination of media design and content that was integrated into concrete learning activities, as described by Edgar Dale (1946) that the media, through its combination of colors, images, and attractive physical forms, helps children engage at the concrete and semi-concrete levels of experience, making it easier for them to understand concepts. Therefore, the media can proceed to the field-testing stage. The implementation was conducted with children aged 4–5 years at the Early Childhood Education (ECE) institution serving as the research site, involving the classroom teacher as a learning facilitator. At this stage, the teacher first prepared the learning materials, including the Daily Learning Implementation Plan (DLIP), speaking ability observation instruments, and the Jam

Genius media, which had been revised based on the validators' suggestions. The learning process was carried out through three main stages: the introductory activity, the core activity, and the closing activity.

During the core activity, the Jam Genius media was used as an interactive learning aid that integrated the animal theme with oral language stimulation. The children were invited to turn the clock hand, observe pictures of animals, name the animals, imitate animal sounds, and construct simple sentences based on the pictures indicated. This activity was designed to encourage children's verbal participation through open-ended questions and two-way conversations between teachers and children, as well as among peers.

The results of observations during the implementation indicated an increase in children's engagement in the learning process. The children appeared more enthusiastic, more confident in speaking, and more active in responding to the teacher's questions compared to before the use of the media. Concrete, visual, and manipulative media helped children understand the context of conversations and facilitated the process of expressing themselves orally. In addition, the teacher played a greater role as a facilitator who guided interactions rather than serving as the centre of one-way information delivery, as was the case before the development of the media. The results of the user perception test (teachers) of the media showed an average score of 3.94, which was categorized as "highly feasible." This confirms that, from a practical perspective, the media is easy to use, engaging, and appropriate for the characteristics of children aged 4–5 years. Several suggestions for improvement, such as enhancing color brightness, varying storytelling techniques, and strengthening visual elements, were incorporated before conducting the effectiveness test.

3.5. Effectiveness of the Media on Children's Speaking Ability

The evaluation stage in this study covered two main aspects, namely the evaluation of media feasibility and the evaluation of media effectiveness.

a. Feasibility Evaluation

The feasibility evaluation was conducted through expert validation and user perception testing. Based on the validation results, the total score obtained fell within the "feasible" category interval according to the 1–4 scale conversion table. In the aspects of media design and learning, all indicators predominantly received scores of 3 and 4. This indicates that the media has met the criteria in terms of attractiveness, safety, suitability for children's characteristics, and alignment with language learning objectives. The results of the teacher perception test, with an average score of 3.94, further confirmed that the Jam Genius media was feasible for use in the learning process and could proceed to the effectiveness testing stage.

b. Effectiveness Evaluation

The effectiveness evaluation was conducted using statistical analysis with the Mann–Whitney U test to compare the speaking abilities of children in the experimental group and the control group. The analysis results showed an Asymp. Sig. (2-tailed) value of 0.000, which is lower than the significance level of 0.05. Therefore, H_0 was rejected and H_1 was accepted, indicating a significant difference in the speaking abilities of children between the group that used the Jam Genius media and the group that did not use the media.

Ranks

	Learning Group	N	Mean Rank	Sum of Ranks
Children's speaking skills	Experiment	13	14.96	194.50
	Control	8	4.56	36.50
	Total	21		

Test Statistics[a]

	Children's speaking skills
Mann-Whitney U	.500
Wilcoxon W	36.500
Z	-3.758
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000[b]

a. Grouping Variable: Learning Group
b. Not corrected for ties.

The increase in scores in the experimental group was observed across nearly all indicators of speaking ability, including confidence in answering questions, the ability to identify and use vocabulary, the ability to construct simple sentences, and participation in conversations. Meanwhile, the improvement in the control group was relatively lower and did not show a significant change. These findings indicate that the use of Jam

Genius media is not only theoretically and practically feasible, but also empirically effective in improving the speaking skills of children aged 4–5 years, as its design is highly attractive and its content is diverse and engaging, making the language development process enjoyable.

4. Discussion

The findings of this study indicate that the Jam Genius media is not only feasible in terms of design and content but is also effective in improving the speaking abilities of children aged 4–5 years. The main significance of this finding lies in the transformation of the quality of learning interactions: from a one-way, worksheet-based pattern toward participatory and dialogic learning. Thus, the effectiveness of the media is reflected not merely in differences in outcomes, but also in changes in classroom communication dynamics. Theoretically, these findings are consistent with the sociocultural perspective, which positions interaction as the foundation of language development. Vygotsky's (1978) ideas emphasize that language develops through symbolic activities mediated by cultural tools. The Jam Genius serves as a tool that bridges interactions between teachers and children, as well as among children themselves. The activities of turning the clock hand, pointing to numbers, and responding to visual stimuli create a symbolic context that enables children to produce utterances within their zone of proximal development. This is consistent with the elaboration that manipulative media integrated with symbolic play can enhance conversation, the use of questions, and verbal interaction, which are closely related to language development (Creaghe et al., 2021).

This finding is also consistent with the study by Yang et al. (2021), which demonstrated that the quality of teacher–child interactions significantly contribute to early childhood vocabulary competence. The implementation of Jam Genius shifted the teacher's role toward that of a dialogue facilitator who used open-ended questions and speech elaboration. This change enriched the quality of the learning process (process quality), as emphasized by Thi et al. (2025) that responsive interaction is a key determinant of the effectiveness of Early Childhood Education (ECE) learning. Thus, the improvement in children's speaking abilities cannot be separated from the enhancement of the quality of interactions facilitated by the media. From a developmental perspective, these findings reinforce the view that ages 4–5 represent a crucial phase for the expansion of vocabulary and syntactic structures. Dionne and Rezzonico (2025) demonstrated that language abilities at ages 3–5 are closely correlated with social competence, indicating that strengthening language development during this period has broad developmental implications. Furthermore, the meta-analysis by Jago et al. (2025) confirmed that preschool vocabulary and grammar significantly predict early reading skills, including reading comprehension and word recognition. Thus, improving children's speaking abilities through the Jam Genius media may have not only short-term effects but also the potential to strengthen the foundation of children's early literacy skills.

Compared with recent studies that primarily focus on digital media, this study demonstrates that physical, manipulative media remain relevant and effective. The study by Solichah and Fardana (2024) showed that a multisensory approach is effective in supporting early literacy development through the integration of visual, auditory, and kinesthetic stimuli. The Jam Genius adopts this principle by combining visual and manipulative (kinesthetic) elements with language production in integrated play activities. This approach enables active child engagement and enriches direct verbal interaction. In the context of Early Childhood Education (ECE) settings with limited access to technology, game-based manipulative media can serve as a practical and contextual learning alternative.

Theoretically, this study contributes to strengthening the concept of cross-domain integration in child development. The Jam Genius does not separate numeracy and language; rather, it integrates both within structured symbolic play. This integration broadens the understanding that language stimulation can be optimized through thematic activities that simultaneously engage other cognitive domains. Thus, the educational clock media is no longer understood merely as a tool for introducing the concept of time, but rather as a device for facilitating dialogic language stimulation.

The practical implications of this study for Early Childhood Education (ECE) learning include three main aspects. First, teachers need to design media that is not only attractive but also incorporates clear scenarios for verbal interaction. Second, language learning should be integrated into thematic play activities to create meaningful communicative experiences. Third, the use of open-ended questions and elaboration techniques is a key strategy for optimizing the function of the media. This approach strengthens communicative, play-based, and child-centered pedagogy. Overall, this study confirms that systematically and contextually designed game-based manipulative media can improve the quality of learning interactions while simultaneously

enhancing young children's speaking abilities. The Jam Genius contributes not only as an innovative product but also as a pedagogical model that repositions early childhood language learning toward a more dialogic, reflective, and child-centered approach.

5. Conclusion

This study confirms that Jam Genius makes a scientific contribution by enriching research on non-digital manipulative media integrated with early childhood language stimulation, while also offering a practical solution for ECE teachers to create more dialogic and participatory learning. Although this study was limited to a small sample and focused on speaking skills, the findings open opportunities for broader research involving diverse cultural contexts and integration with other developmental domains. Future research is recommended to examine the effectiveness of this media with more diverse populations, develop variations in themes and supporting technologies, and expand its scope to include other language skills, so that Jam Genius can serve as a more comprehensive model of innovative learning media.

6. Acknowledgement

This section contains gratitude to sponsors, fund donors, resource persons, or parties that played a very important role in conducting the research. If you mention the name of a person or institution as a thank you, the author must ask for his permission. Authors do not need to write a thank-you note to the editor.

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