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Ethno Literacy-Based Early Childhood Articulation Intervention through Unplugged Coding Maze Media

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ABSTRACT

Speech sound disorders (SSD) in early childhood hinder communicative and social aspects. Conventional, repetitive teaching methods often fail because they ignore the cultural context and emotional involvement of children. This approach places ethno literacy as the main framework of intervention which is operationalized through the unplugged coding maze media in stimulating articulation. The research used a descriptive qualitative approach with a case study design on seven children aged 4-5 years with mild SSD criteria at TK Muslimat NU Nawa Kartika, Kudus Regency. Data were collected through participant observation, in-depth interviews, and documentation, and analyzed using the Miles, Huberman, and Saldaña model with triangulation of sources and techniques and member checking. The results of the study showed an average increase in phoneme accuracy of 30.5%. Within the framework of ethno literacy, the use of cultural narratives operationalized through the unplugged coding maze media has been proven to reduce speaking anxiety and increase children's intrinsic motivation. In contrast to conventional speech therapy methods that emphasize repetition exercises, this approach integrates computational thinking and culturally based neurolinguistic stimulation, thereby accelerating the phonological encoding process. The novelty of this research lies in the use of ethno literacy as the main framework of intervention, with unplugged coding maze as a mediation medium in stimulating early childhood articulation. These findings provide implications in the form of a holistic and contextual language intervention model for early childhood educators.

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1. INTRODUCTION

Speech sound disorders (SSD) in early childhood are a complex phenomenon that goes beyond just oral motor mechanism errors, with a global prevalence reaching 8-15% (Aslam et al., 2020; Shriberg et al., 2019; Tambyraja et al., 2020). Neuropsychologically, SSD represents an obstacle in the formation of phonological representations in the brain that has a systemic impact on the clarity of communication, early literacy readiness, and the child's psychosocial adaptation abilities (Bowen, 2018; Greenwell & Walsh, 2021; Langbecker et al., 2020). Failure to identify and address these barriers early risks leading to long-term learning impairments, given that articulation accuracy is a key foundation for decoding language symbols and social interaction. Globally, the number of cases in early childhood ranges from 8-15%, with variations influenced by the quality of the linguistic environment and language stimulation (Shriberg et al., 2019; Tambyraja et al., 2020). In the context of education in Indonesia, the limited availability of innovative and contextual learning media means that articulation interventions are often carried out conventionally and are less interesting. This condition makes children tend to be passive, easily lose focus, and not actively involved in the learning process. This shows that there is a gap between children's development needs and the structured strategies implemented in the field.

In Indonesia, articulation interventions in PAUD institutions are still dominated by phonetic drill methods that are repetitive, decontextual, and minimally use innovative media. This conventional approach often fails to achieve optimal results because it tends to trigger boredom and ignores the cognitive-affective aspects that are crucial for the natural internalization of language sounds (Fulcher-Rood et al., 2020; Janus et al., 2019; Volkmer et al., 2020). Intervention practices that only emphasize mechanical procedures without involving the child's emotional attachment cause the language stimulation process to be rigid, so that the child has difficulty automating speech in the context of everyday communication.

The failure of articulation interventions so far is not only rooted in methodological issues, but also touches on epistemological aspects, namely the neglect of cultural identity as a fundamental psychological variable in language processing. From a neurolinguistic perspective, language is not processed mechanically in isolated areas, but rather integrated with semantic-affective networks triggered by cultural identity (Chen et al., 2024; Liu et al., 2023). When children are exposed to stimuli that are relevant to their cultural background, there is more intense activation of the cerebral cortex, which in turn strengthens the phonological encoding process. Without cultural engagement, articulation exercises often lose their cognitive meaning, so children tend to have difficulty internalizing language sounds that are foreign to their mental schema.

This is in line with the Funds of Knowledge theory which emphasizes that cultural experiences and local wisdom are the main sources of cognitive activation for early childhood (Alam et al., 2025; Hedges, 2022). Daily life experiences converted into learning materials will create a bridge between new information and existing knowledge structures in children's long-term memory. Therefore, an ethno literacy approach such as the integration of the Gusjigang philosophy (Good morals, Good at reciting the Koran, Trade/independent) in Kudus is very relevant as an instrument for building intrinsic motivation. Through familiar cultural narratives, children no longer feel they are undergoing oppressive therapy, but rather are engaged in personally meaningful communicative activities, which effectively lowers their affective filter threshold in practicing phonemes.

As an innovative solution to bridge cognitive, motoric, and linguistic aspects, the unplugged coding maze media offers a holistic, adaptive intervention mechanism for early childhood. This device-free coding activity is essentially a sequential logic exercise that parallels speech motor planning; the sequence of instructions in the maze demands precision motor planning similar to the sequence of articulatory movements used in sound production (Álvarez-Herrero, 2020; Su & Yang, 2023). Through physical activities on the maze, children simultaneously train gross and fine motor coordination which is positively correlated with functional speech maturity.

Theoretically, the effectiveness of speech intervention reconstruction in early childhood with SSD depends heavily on the balanced integration of functional motor stimulation and meaningful cognitive

activation. (Chaparro-Moreno et al., 2019; Justice et al., 2018) emphasized that a responsive language environment rich in contextual stimuli has been shown to accelerate the fulfillment of a child's Zone of Proximal Development (ZPD) in producing complex language sounds. When the process of pronouncing phonemes is associated with familiar cultural narratives, children's cognitive load in processing word meanings decreases drastically, so that their mental energy can be fully allocated to controlling the movements of articulatory organs such as the lips and tongue (Hedges, 2022). This synergy is supported by the Funds of Knowledge principle which states that activating children's domestic cultural background into inclusive classrooms will increase intrinsic motivation and reduce affective filters, which are the main psychological requirements for the success of early childhood speech automation (Caingcoy, 2024; Galenzoga, 2025; Rifa'i et al., 2025).

The scientific basis of this intervention is strengthened by the theory of speech motor planning which runs parallel to the sequential logic of physical media. (Álvarez-Herrero, 2020; Su & Yang, 2023) show that unplugged coding activities are not just a computational thinking training tool, but rather a tactile-kinesthetic stimulation that requires children to plan a precise sequence of steps in a maze. The sequence of directional commands in this coding maze neurologically stimulates the brain's ability to structure the sequence of phoneme sounds before they are articulated by the mouth. Through physical activities integrated with ethno literacy content, children with SSD not only experience improvements in speech intelligibility, but also in long-term phonological working memory abilities (Nurani et al., 2025; Wren et al., 2016). Thus, the combination of coding logic and local cultural resonance creates a holistic intervention model that is able to improve speech motor function while increasing children's communicative self-efficacy in their social environment (Junaedi et al., 2023; Monica et al., 2023; Nurani et al., 2025).

Although previous research has examined the effectiveness of coding in improving computational thinking skills (Schmied et al., 2025) as well as the use of ethno literacy for character development, the use of ethno literacy as an intervention framework operationalized through unplugged coding maze media in the clinical context of SSD is still very limited. So far, not many studies have explored how the logic structure of coding can be modified with local wisdom content to overcome specific articulation barriers. This gap is the starting point for this research to present learning media that is able to synergize technical-logical stimulation with emotional-cultural content.

This research fills this gap by implementing the narrative of Kudus local wisdom into the unplugged coding maze activity at TK Muslimat NU Nawa Kartika. The novelty of this research lies in the repositioning of the coding maze as not just a logical thinking tool, but as a neurolinguistic stimulation instrument that utilizes cultural resonance to accelerate the improvement of phoneme articulation. This study positions ethno literacy as the main framework of articulation intervention, with unplugged coding maze as a mediation medium that operationalizes linguistic, cognitive, and emotional stimulation of early childhood. The original combination of logical-mathematical thinking structures (coding) with emotional-sociocultural content (Kudus local wisdom) as a speech therapy method for early childhood is a cutting-edge approach that has never been tested in previous research.

Based on all the scientific arguments above, the researcher has a deep academic interest in studying the integrative potential of this media in an inclusive early childhood education setting. This research is specifically aimed at filling the methodological and practical gaps that have been complained about by early childhood educators in the field. As a conclusion of state of the art review, this study definitively aims to comprehensively analyze the implementation of articulation intervention based on Kudus local wisdom ethno literacy which is operationalized through unplugged coding maze media, as well as to test its measurable influence on increasing phoneme accuracy, emotional involvement, and active verbal participation in seven children with speech disorders at TK Muslimat NU Nawa Kartika, Kudus Regency.

2. METHODS

The intervention in this study was designed based on ethno literacy, with unplugged coding maze media as an operational tool in implementing articulation stimulation. This study uses a descriptive qualitative case study design to understand the implementation of ethno literacy-based articulation interventions in specific social and cultural contexts. The focus of the research is not only on the results, but on the intervention process and children's responses during media use. This approach was chosen because it allows researchers to comprehensively understand how ethno literacy-based learning interventions are applied in natural situations. The case study design refers to Yin (2018), framework which emphasizes the importance of contextual analysis of complex phenomena.

The research subjects consisted of seven children aged 4-5 years at TK Muslimat NU Nawa Kartika, Kudus Regency. Subjects were selected using purposive sampling techniques based on inclusion criteria in the form of a diagnosis of mild speech sound disorders (SSD) with characteristics of articulation errors such as phoneme substitution and omission. Subject determination is carried out through initial screening using the Articulatory Screening Test instrument to identify specific articulation barriers in each child. Supporting data was obtained from class teachers and parents as informants to strengthen validity through source triangulation. The intervention media used is an unplugged coding maze which is designed thematically. The media specifications consist of a 1x1 meter maze board equipped with visual instruction cards in the form of clue cards, icon cards and mystery cards. These cards are picture cards that not only function as algorithm navigation, but also as targets for specific phonemes such as /m/, /j/, and /p/. The use of this media integrates physical movement with contextual linguistic stimulation.

Data collection techniques were carried out through participatory observation, semi-structured interviews, and audio-visual documentation during the learning process. Observations focused on changes in children's articulation abilities when interacting with ethno literacy materials. Interviews were used to obtain information on children's language development from the perspective of teachers and parents, while documentation was used to record the process and results of the intervention objectively. Data analysis was carried out with reference to the model of Miles et al. (2023) which includes the stages of data condensation, data presentation, and drawing conclusions. Specifically, the analysis was conducted cyclically during the 6-week intervention period to monitor the progress of the child's articulation development each week. In the condensation stage, observation data is selected with a focus on the type of articulation errors and children's responses to ethno literacy stimuli. Next, the data was coded using In Vivo Coding techniques to maintain the authenticity of the child's speech. The codes are grouped into error categories (substitution, omission, distortion) and analyzed for their relationship to the given stimulus to identify patterns of phonological ability development.

Data validity is guaranteed through triangulation of sources and techniques as well as member checking. To increase reliability, this study implemented inter-rater reliability involving two independent assessors using the same assessment rubric. The level of agreement was analyzed using the Kappa coefficient (Li et al., 2023; McHugh, 2012) which showed a value of 0.78, indicating a substantial level of agreement. In addition, an audit trail is used to maintain transparency in the analysis process while still adhering to the ethical principles of early childhood research.

3. FINDINGS AND DISCUSSION

3.1 Finding

The study was conducted on seven children with mild speech sound disorders (SSD) criteria at TK Muslimat NU Nawa Kartika, Kudus Regency for 6 weeks with a frequency of three meetings per week. The indicators of articulation ability in this study were determined operationally through two main aspects, namely phoneme accuracy and target phoneme type. Phoneme accuracy is measured in percentage (%) based on the number of phonemes pronounced correctly compared to the total phonemes targeted in each learning session, thus providing a quantitative picture of the child's pronunciation clarity level. Meanwhile, the target phoneme types are focused on phonemes that are

generally difficult for early childhood children with speech disorders, including bilabial consonants (/b/, /p/), alveolar (/n/, /r/, /s/), palatal (/j/), and nasal velar (/ŋ/). The selection of these phonemes is based on the level of articulatory complexity and their relevance to the ethno literacy-laden vocabulary used in the coding maze media. Thus, this indicator not only measures the final result in the form of phoneme clarity, but also maps the development of children's articulation abilities specifically in each category of sounds practiced.

The empirical research results show that the implementation of ethno literacy-based articulation interventions operationalized through unplugged coding maze media provides a significant contribution and improvement to phoneme accuracy in early childhood with Speech Sound Disorders (SSD). Based on the measured clinical assessment results, the average articulation accuracy (speech accuracy) of the seven subjects experienced a consistent jump in performance, namely increasing from an initial range of only 35–60% in the pre-test stage to 68–88% in the post-test stage. Cumulatively, the improvement index (gain score) achieved by all subjects was in the range of 28% to 35%.

The highest individual improvement was recorded in subject S5 with a positive deviation of +35%. This transformation was triggered by the high responsiveness of subject S5 to the kinesthetic-visual stimulation provided by the labyrinthine pathway. On the other hand, although the subject with the lowest progress only recorded an increase of 28%, this achievement methodologically still indicates a level of speech intelligibility that is in the good and adaptive category for daily communication of preschool-aged children. This statistical leap proves that combining local cultural scripts with logical problem-solving can disrupt the stagnation of phonological development that usually occurs in conventional intervention methods (Rupert et al., 2023; Wren et al., 2016).

Phonetic analysis of transcripts of audio-visual recordings showed that the greatest reduction in speech errors occurred in the process of deleting and replacing crucial phonemes. Before the intervention, the majority of subjects experienced severe difficulties in placing the articulatory organs precisely when pronouncing complex language sounds. However, visualizing logical steps in the unplugged coding maze indirectly trains the speech motor planning coordination ability in the child's brain (Su & Yang, 2023).

When children move their bodies to create a route algorithm on a maze board with the theme of Kudus local wisdom, simultaneous activation occurs in their gross motor neural network and neurolinguistic circuit. This pattern reduces the child's cognitive workload in processing words, so that their concentration can be fully allocated to organically controlling the accuracy of lip movements (bilabial phonemes) and the tip of the tongue on the gums (alveolar phonemes) (Greenwell & Walsh, 2021; Hu et al., 2025). This flexibility and automaticity of speech occurs because familiar ethno literacy material successfully triggers psychological comfort, lowers the speech anxiety threshold (low affective filter), and triggers high verbal communication initiatives without any coercion (Hedges, 2022). All quantitative and qualitative findings regarding the dynamics of the development of the subject's articulation are summarized in the following data instruments:

a. Subject Articulation Profile Data (Initial vs. Final Observation)

The table below summarizes the average articulation accuracy scores (percentage of correctly pronounced phonemes) in culturally loaded vocabulary.

SUBJECT	AGE	PRE (%)	POST (%)	IMPROVEMENT (%)	PHONEME FOCUS	PROGRESS	CATEGORY
S1	4	45	75	+30	Alveolar (/r/)	/r/→/l/ substitutions decreased; tongue trills begin to	High Improvement

						appear in the word "Menara"	
S2	5	50	82	+32	Nasal (/ŋ/)	Able to pronounce the nasal velar phoneme consistently in the word "Jenang"	High Improvement
S3	4	40	68	+28	Alveolar (/s/)	*Sibilants (/s/) begin to be heard clearly; the duration of focus on the maze increases*	Moderate Improvement
S4	5	55	85	+30	Bilabial (/p/)	The differentiation of /p/ and /b/ pops is stable; speech is more coherent according to the coding flow	High Improvement
S5	4	35	70	+35	Palatal (/j/)	The highest improvement; the child who was initially passive became very verbally proactive	High Improvement
S6	5	60	88	+28	Palatal (/j/)	The articulation of the phoneme /j/ is no longer confused with /l/; the sequential logic is very mature	Moderate Improvement
S7	4	42	72	+30	Alveolar (/n/)	Speech flow is more fluid; omissions of middle phonemes are	High Improvement

	drastically reduced

b. Flowchart of Children's Verbal Responses

The process of improving children's communication in this study took place in stages and was integrated through coding maze activities that combined stories, games, and language exercises in one meaningful learning flow. The initial stage begins with providing visual stimulus in the form of a picture of the "Menara Kudus" that is contextual to the child's life, followed by storytelling activities that build emotional involvement while introducing a narrative flow as the basis for the activity. Next, children enter the cognitive connection stage by linking the stories and visual symbols with experiences they have had, thus forming a more meaningful understanding of local culture. From this process, verbal motivation emerges, marked by the child's natural urge to speak through vocabulary, imitation of story lines, and responses to teacher questions. This motivation is then reinforced in the coding maze activity, where children are asked to trace and rearrange the sequence of the story through play, which simultaneously trains sequencing and language skills. The next stage is articulation practice through repetition of phonemes and contextual vocabulary that appear in the story, so that pronunciation practice occurs naturally in a playful atmosphere. The integration of visual stimuli, cultural narratives, motor activities, and phonetic exercises results in increased speech clarity, demonstrated through more precise and coherent pronunciation and increased confidence in communicating.

The success of this systematic intervention flow proves that unplugged coding maze-based speech stimulation reconstruction is able to overcome the limitations of conventional phonetic drill methods which tend to be rigid, monotonous, and decontextual. From a neurolinguistic perspective, the integration between physical navigation on the floor labyrinth and the pronunciation of local Kudus vocabulary such as "Menara" (/mənarɑ/) and "jenang" (/dʒənaŋ/) simultaneously activates the cortical sensorimotor circuit and the semantic-affective network in the child's brain. Computational thinking activities when constructing directional algorithms not only train logical reasoning, but also act as tactile-kinesthetic stimuli that strengthen preschoolers' speech motor planning abilities (Álvarez-Herrero, 2020; Su & Yang, 2023). The sequential path in the maze forces the brain to map out a sequence of physical steps that neurologically run parallel to the programming of the sequence of movements of the articulatory organs (lips, tongue, and gums) before the actual production of speech sounds. By grounding phonetic exercises in familiar funds of knowledge or sociocultural proximity, the subject's speech anxiety threshold (affective filter) can be suppressed to its lowest point (Alam et al., 2025; Hedges, 2022). As a result, the process of automating the target phonemes, especially in the articulation obstacles of the bilabial and alveolar categories which previously experienced severe omissions and substitutions, can be achieved organically because the children feel they are playing, not being intervened or judged clinically.

The pedagogical implications of these findings emphasize the importance of a paradigm shift in the handling of Speech Sound Disorders (SSD) in inclusive PAUD institutions, from a clinical-mechanical basis to a humanistic socio-cognitive one. Researchers observed that when local ethno literacy content was realized through tactile-kinesthetic media, children not only obtained functional improvements in their peripheral articulation organs, but also experienced performative strengthening in the brain's executive functions, such as phonological working memory and self-regulation. Active engagement of all the senses (multisensory engagement) while navigating this cultural maze accelerates the transfer of speaking skills from the practice room into everyday social communication contexts (Rupert et al., 2023; Wren et al., 2016). This intervention pattern positions local wisdom not merely as a sticky material, but as a psychological platform that fosters self-confidence (self-efficacy) and a sense of cultural ownership in children. Therefore, the synergy between coding logic and sociocultural resonance offers a transformative learning model that has been proven effective in restoring the communicative agency of young children without uprooting them from their cultural identity (Junaedi et al., 2023; Monica et al., 2023).

The flow of children's verbal responses in the process of improving communication during intervention can be explained through the following diagram:

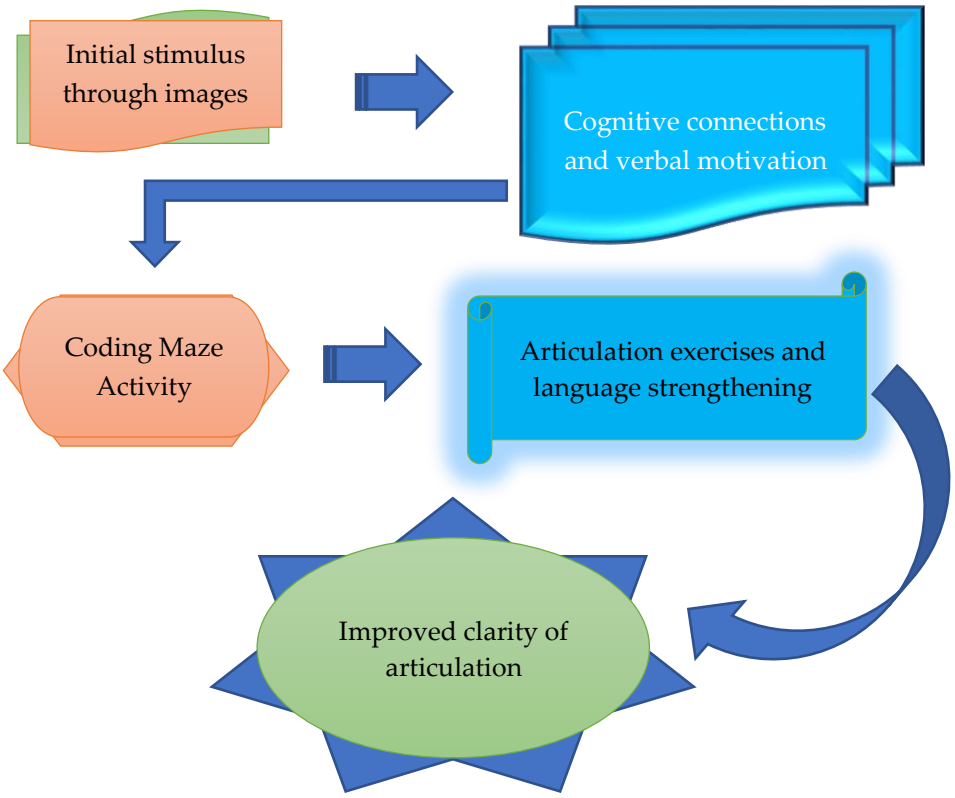

Figure 1 Flowchart of children's verbal responses

This intervention flowchart confirms a contemporary principle in the realm of developmental neurolinguistics that the restoration and improvement of articulation clarity (speech intelligibility) in children with Speech Sound Disorders (SSD) is not a result that can be achieved instantly through rigid sound imitation exercises, but rather a circular process that involves holistic integration between emotional, cognitive, and linguistic aspects. In the emotional domain, the child's psychological comfort is placed as the main gateway through handling based on Kudus' local ethno literacy which effectively breaks down the affective filter and triggers the child's intrinsic motivation to speak up without clinical pressure. Furthermore, in the cognitive domain, computational thinking activities while navigating sequential paths on an unplugged coding maze board stimulate brain function, where mapping the sequence of physical steps neurologically runs parallel with strengthening speech motor planning abilities to regulate the coordination of articulatory organs such as the lips and tongue. Through this emotional synergy and logical sharpness, the child's linguistic domain is finally stimulated optimally, where the process of automation and pronunciation of target phonemes, especially in the bilabial and alveolar categories, can be achieved organically because it is attached to meaningful vocabulary that is already familiar to their daily lives. Thus, the description of this chart proves that clear, coherent and permanent articulation in early childhood can only be achieved when an instructional media is able to integrate affective calm, logical reasoning structure, and oral motor precision in one complete multisensory play flow.

Figure 2 Teacher provides stimulus to the child

Figure 3 Playing activity with coding maze media

c. Observation and Interviews

Observation and interview data show changes in communication, where previously passive children begin to show verbal initiative, especially when using local culturally charged vocabulary such as “Menara” (/mənarɑ/) and “jenang” (/dʒənaŋ/). Substantial improvements occurred in bilabial phonemes (such as /m/, /p/, /b/) and alveolar phonemes (such as /t/, /d/, /n/, /l/), which had previously been major obstacles in speech production. According to a contemporary psycholinguistic perspective, the use of ethno literacy materials that have sociocultural proximity has been proven to be able to significantly mitigate affective filters or emotional barriers in early childhood. When children's psychological burden is reduced because they recognize the cultural objects being studied, their intrinsic motivation to explore the sounds of the language increases dramatically. This is in line with the Funds of Knowledge principle which emphasizes that the activation of local wisdom-based mental schemas in inclusive settings acts as a primary catalyst that triggers communicative agency and active verbal participation in children with language barriers (Hedges, 2022).

The success of improving the articulation of bilabial and alveolar phonemes is not just the result of repeated practice, but rather a manifestation of strong synchronization between psychological comfort and strengthening speech motor skills. Local vocabulary such as “Menara” and “jenang” that are embedded in children’s long-term memory act as cognitive bridges that make it easier for the brain to recall the correct phonological representation. When children play unplugged coding maze, the activity helps to concretize the sequential logical structure of steps, which neurologically parallels the sequence of movements of the articulatory organs (lips and tongue) in producing sounds. Researchers believe that the integration of tactile media has successfully transformed children's perceptions of the speech therapy process, which was initially frightening, into an adaptive play activity. Thus, the utilization of Kudus local wisdom operationalized through a coding method without devices has proven to be a very potential preventive and solution strategy to optimize children's speech clarity without uprooting them from the cultural roots of their surrounding environment.

3.2 Discussion

The results of this study indicate that ethno literacy-based articulation interventions operationalized through unplugged coding maze media as an operational tool, not only function as learning, but as a stimulation mechanism that integrates cognitive, linguistic, and cultural aspects. The use of unplugged coding maze media within an ethno literacy framework has been proven to be effective in improving children's articulation abilities. This effectiveness is not only determined by the frequency of phonetic practice, but also the child's involvement in meaningful play activities.

As a main framework, ethno literacy allows phoneme repetition to occur naturally, which is then operationalized through the unplugged coding maze media, thus supporting the process of automating

sound production without pressure. Ethno literacy serves as the main foundation of the intervention, while the unplugged coding maze media becomes the operational mechanism that bridges articulatory stimulation with the child's cultural experiences. Within the Funds of Knowledge framework, cultural experience serves as a source of cognitive activation that strengthens the link between meaning, memory, and speech production. The use of local vocabulary such as "Menara Kudus" and "jenang" not only increases linguistic familiarity but also emotional engagement, which in turn increases children's intrinsic motivation to communicate.

The effectiveness of local vocabulary such as "jenang" in training palatal consonants /j/ and nasal velar /ŋ/ cannot be separated from its rich and familiar phonological characteristics for children. From the perspective of Culturally Responsive Pedagogy (Gunn et al., 2021; Hu et al., 2025), the use of language that is close to the child's cultural experience allows for simultaneous cognitive and emotional engagement. The word "jenang" not only functions as a phonetic stimulus, but also as a cultural symbol that has social meaning and sensory experience for children. This strengthens the phonological encoding process because sounds are not processed abstractly, but rather are tied to meaningful episodic memory. These findings broaden the understanding that the effectiveness of articulation exercises is not only determined by the complexity of phonemes, but also by the closeness of meaning in the child's cultural context.

Empirically, this finding is also supported by subject development data, where 5 year old children (S2, S4, S6) showed more significant improvement. This indicates that cognitive maturity combined with an ethno literacy approach accelerates phoneme mastery, especially when children are exposed to sounds in meaningful and naturally repeated contexts. Motivational factors are a key element in the success of interventions. Ethno literacy-based articulation intervention with unplugged coding maze media functions as an operational instrument that transforms phoneme repetition activities into exploratory experiences, thereby reducing communication anxiety and increasing children's active participation. Thus, the frequency of practice increases naturally as the child engages voluntarily in learning activities. Technically, within the framework of ethno literacy, articulation exercises are carried out through a cultural narrative-based game flow with the unplugged coding maze media, where children pronounce vocabulary, rhymes, or short stories in the context of a thematic journey. This activity trains articulatory coordination more precisely in a playful atmosphere, thereby reducing stress and increasing children's self-confidence. From a neurolinguistic perspective, sound production is more optimal when connected to real experiences. Simultaneous activation of semantic and affective memory allows the articulation process to take place in a more meaningful way, not just in a rigid and repetitive manner. Thus, ethno literacy-based intervention, mediated through the unplugged coding maze, not only increases phonemic accuracy, but also strengthens the integration between language, experience, and emotion.

Theoretically, this study suggests that cultural identity plays a mediating role in clinical language intervention, working through the mechanisms of emotional engagement, activation of meaningful memories, and strengthening of neurolinguistic connections. This model expands the Funds of Knowledge framework (Hedges, 2022) by positioning culture not only as a learning resource, but as a catalyst in the language rehabilitation process. In a broader context, this model emphasizes that cultural integration in language intervention is not merely a contextual approach, but is a cognitive mechanism that can be replicated in various multicultural settings with adjustments to cultural resources.

4. CONCLUSION

The conclusion of this study shows that ethno literacy-based early childhood articulation interventions operationalized through unplugged coding maze media as a mediation tool have proven effective in increasing phoneme clarity, speech fluency, and children's self-confidence. These findings confirm that the success of articulation intervention is not only determined by phonetic practice, but also by emotional engagement and the meaningfulness of the learning context. Theoretically, this study confirms that the success of articulation intervention is not only determined by phonetic exercises, but

also by emotional involvement and the meaningfulness of the learning context. Theoretically, this study confirms that the success of articulation intervention is not only determined by phonetic exercises, but also by emotional involvement and the meaningfulness of the learning context.

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