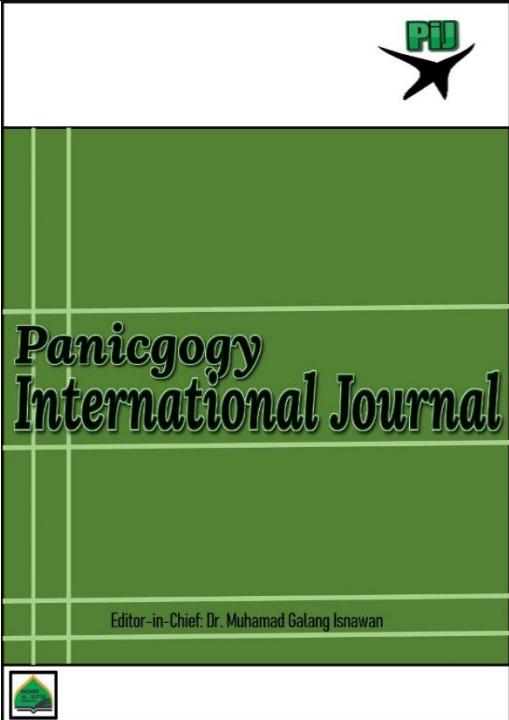


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|  | <p><b>Peer-mediated language development in early childhood: A Vygotskian perspective on speech acquisition in children aged 4-5 years</b></p> <p><b>Riska Juniar Suprihatin<sup>1</sup>, Ade Dwi Utami<sup>2</sup>, Erif Ahdhianto<sup>3</sup></b></p> <p><sup>1</sup>Master's Program in Early Childhood Education, Universitas Negeri Jakarta, Indonesia, <a href="mailto:riskajuniarsuprihatin@gmail.com">riskajuniarsuprihatin@gmail.com</a></p> <p><sup>2</sup>Master's Program in Early Childhood Education, Universitas Negeri Jakarta, Indonesia, <a href="mailto:ade.dwi.utami@gmail.com">ade.dwi.utami@gmail.com</a></p> <p><sup>3</sup>Master's Program in Early Childhood Education, Universitas Negeri Jakarta, Indonesia, <a href="mailto:erif@unj.ac.id">erif@unj.ac.id</a></p> |
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## Peer-mediated language development in early childhood: A Vygotskian perspective on speech acquisition in children aged 4-5 years

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### Abstract

Grounded in Vygotsky's sociocultural theory, this qualitative single-case study examined how peer interaction supports phonological development in a 4-year-old child (Agis) with expressive speech delay. Data were collected through three months of naturalistic observation (36 sessions, ~52 hours) in playgroup and home settings, combining field notes, video recordings, photographs, and brief parental interviews. Data were analyzed through theory-guided thematic and Vygotskian discourse analysis of three focal episodes. Findings show that a more competent peer (Zura) provided modeling, phoneme segmentation, and non-judgmental correction that functioned as scaffolding within Agis's Zone of Proximal Development, supporting progressive improvement in target phonemes (/g/, /s/, /r/) and, in one instance, transfer to a novel word in a home context. Peer-mediated practice was also associated with sustained engagement and an absence of observed distress during practice attempts. The study illustrates specific mechanisms through which peer scaffolding may support phonological learning and suggests tentative implications for inclusive early childhood practice, while findings remain exploratory given the single-case, non-comparative design.

**Keywords:** early childhood language development, Lev Vygotsky, peer interaction, sociocultural theory, speech delay

### 1. Introduction

Language development constitutes one of the most critical aspects of early childhood development, serving as the foundation for communication abilities, cognitive processing, and environmental comprehension. According to Finders et al. (2023), language abilities are fundamental to various cognitive, behavioral, and social-emotional outcomes in children. Among the diverse facets of language development, speaking ability occupies a particularly central role. Through speech, children can express thoughts, desires, and emotions to others. Sun et al. (2021) emphasize that language skills enable children to interact with others and develop social competencies. These abilities also facilitate children in building social relationships, participating in group activities, and developing self-confidence. In essence, speaking transcends mere linguistic skill, serving as a vital medium for children's social-emotional and cognitive development. This holistic view aligns with broader early childhood education paradigms that treat exploration and play, rather than isolated skill drills, as the primary vehicle for children's naturally-unfolding development (Suprihatin, 2024).

Furthermore, social and cultural environments play crucial roles in enriching children's language abilities. McKean et al. (2023) emphasize that language development during early

childhood is substantially influenced by social contexts and the accumulation of developmental experiences. Through interactions with adults and peers, children learn to recognize language structures, refine pronunciation, and expand vocabulary (Custode et al., 2024; Perry et al., 2022). Within early childhood education contexts, teachers and peers function as language models that facilitate children's development through daily communication, particularly during enjoyable play activities. Media- and play-based approaches have likewise been shown to support related early-literacy skills in Indonesian kindergarten settings, such as improved alphabet-letter recognition through flannel-board media (Suari et al., 2023).

In reality, not all children develop at identical rates. Some children experience speech delays attributable to various biological and environmental factors (Reilly et al., 2023). Consequently, social and interactive approaches become essential in helping children overcome such delays. One theoretical framework explaining the role of social interaction in language development is Lev Vygotsky's sociocultural theory. Vygotsky emphasizes that children's language and cognitive development occurs through social interaction with more competent individuals, whether parents, teachers, or peers (Dela Cruz, 2024). According to Bernard (2024), sociocultural theory highlights the complex interactions among children, their social environments, and cultural contexts, emphasizing that learning and development are fundamentally social processes shaped by cultural tools and social connections. Although prior reviews establish that peer interaction is broadly beneficial for language development, the specific, moment-by-moment mechanisms through which peer scaffolding operates for children with speech delay remain less documented; this microgenetic, single-case study addresses that gap. This theory asserts that language development cannot be fully understood through individual efforts alone but requires examination of social and cultural factors, including language, interactions, and behaviors.

Recent research demonstrates that peer interactions positively influence early childhood language development. Washington-Nortey et al. (2022) found, based on a systematic review synthesizing largely observational and correlational evidence, that despite children's limited language abilities, they can still engage in complex conversations during peer interactions, and peer interactions have proven to facilitate language development through social exchanges and involved communicative resources. Liu et al. (2024) complement these findings by demonstrating that interactions with more competent peers positively affect young children's development, helping them build social, cognitive, and language skills for establishing effective relationships. Furthermore, Goodacre et al. (2023) emphasize that social play with peers provides critically important contexts for developing children's communicative skills.

Building upon these perspectives, this study examines a phenomenon observed in the author's own child, Agis, a four-year-old learning to pronounce difficult phonemes with assistance from playgroup peers. Through natural and supportive social interactions, the child demonstrated progress in speaking abilities, particularly in pronouncing previously challenging phonemes. This phenomenon provides a concrete example of how Vygotsky's sociocultural theory operates in real contexts, where children's language development occurs through social guidance and shared experiences in play activities. Peer interactions provide a Zone of Proximal Development (ZPD) that enables children to reach their highest potential with assistance from more skilled others (Alharbi, 2023). Therefore, this study aims to analyze speaking ability development in children based on Vygotsky's sociocultural theory, highlighting peer interaction as a crucial factor in the language acquisition process. Specifically, this study asks: How does

peer scaffolding, as observed turn-by-turn in naturalistic play, support a speech-delayed child's movement through the Zone of Proximal Development toward internalized phonological self-regulation?

## 2. Method

### 2.1 Research Design

This study employed a qualitative case study design utilizing naturalistic observation as the primary data collection method. Case study methodology enables intensive, contextualized examination of contemporary phenomena within real-life settings (Yin, 2018), making it ideally suited for investigating the social processes through which language development unfolds in authentic peer interaction contexts. Unlike experimental designs that abstract phenomena from natural environments, this approach preserves the ecological validity essential for understanding how Vygotskian constructs manifest in spontaneous social situations. Naturalistic observation was prioritized over structured protocols because the study aimed to document peer-mediated learning as it naturally emerges rather than as performed under researcher direction, which may alter the social dynamics under investigation (Washington-Nortey et al., 2022). This approach proved particularly critical for speech delay intervention research, as children with language difficulties often demonstrate heightened sensitivity to evaluative contexts.

The single-case design was justified by the study's theoretical orientation toward microgenetic analysis, detailed examination of developmental change as it unfolds over brief time periods (Wertsch, 1985). This methodology enables the fine-grained, moment-by-moment analysis necessary to trace how social interaction patterns transform into internalized individual capabilities. The three-month observation period was strategically determined to balance methodological considerations, proving sufficient to document initial peer scaffolding episodes and their developmental consequences, including internalization, transfer to new contexts, and emergence of self-regulation. This duration captured a complete developmental arc from initial peer scaffolding through internalization to autonomous self-regulation, providing robust evidence for the study's theoretical claims while accommodating practical constraints including participant availability and the researcher's dual role as parent-observer. This particular case was selected not merely for convenience but because it offered a theoretically information-rich instance: a child with a documented, clinically relevant speech delay embedded in a naturally occurring, prosocial peer network, conditions that are difficult to arrange experimentally but well suited to illuminating how Vygotskian scaffolding mechanisms unfold in real time.

### 2.2 Participant

The study employed purposive sampling to select information-rich cases relevant to peer-mediated language development in children with speech delay. The researcher's position as the primary participant's parent was a deliberate methodological choice rather than convenience sampling: it afforded longitudinal access and children's natural, unguarded behavior that would be difficult for an external observer to obtain, and its interpretive risks were addressed through the reflexivity, triangulation, and member-checking procedures detailed in Section 2.4. The primary participant was Agis (pseudonym), a 4-year-old female child experiencing significant expressive language delay first identified following an episode of febrile seizures during infancy (8 months); a direct causal link between the seizures and the delay was not clinically established and is not claimed here. At age 3, speech-language assessment documented an expressive vocabulary of fewer than 100 words, substantially below the expected 900-1,000 words for

typically developing three-year-olds (Fenson et al., 2007). This assessment was conducted by a licensed speech-language pathologist using a standardized parent-report vocabulary checklist; subsequent phonological screening described below was likewise clinician-administered. Phonological assessment revealed multiple speech sound errors including cluster reduction, velar fronting, liquid simplification, and initial syllable deletion, consistent with phonological delay rather than disorder. At study commencement (age 4 years, 2 months), Agis's vocabulary had expanded to approximately 200-250 words. She attended a community playgroup three times weekly, demonstrated age-appropriate receptive language, and showed no co-occurring developmental concerns beyond expressive language delay.

Peer participants were selected through naturalistic sampling based on existing relationships with Agis and regular playgroup co-participation. Zura (5 years old) emerged as a focal peer due to spontaneous supportive teaching behaviors, demonstrating age-appropriate phonological development (95-100% speech intelligibility) and mean length of utterance of 4.8 morphemes. These indicators were obtained through brief informal speech-sampling by the researcher during observation sessions rather than formal standardized testing and should be read as descriptive estimates of peer language status rather than clinical scores. Zura exhibited prosocial orientation, spontaneously modulating communication style when interacting with Agis by slowing speech rate and providing phonological models without adult prompting. Shila (4 years old) served as secondary peer participant, with slightly advanced phonological development particularly in fricatives and liquids, sound classes where Agis demonstrated greatest difficulty. All three children attended the same playgroup, came from similar socioeconomic backgrounds, and had established positive peer relationships characterized by frequent co-play, providing ecologically valid context for examining peer-mediated phonological learning motivated by genuine social relationships rather than researcher arrangement.

### 2.3 Data Collection

Data were collected through naturalistic observation during spontaneous peer interactions in two settings: the community playgroup and Agis's home environment. The three-month observation period (September-November 2024) yielded 36 observation sessions ranging from 45 minutes to 2.5 hours, totaling approximately 52 hours of direct observation. Observation days and times were scheduled around the playgroup's regular three-times-weekly meeting pattern and the family's routine home play dates, so that sessions captured naturally occurring peer contact rather than researcher-selected occasions; no eligible playgroup or home peer-play session within the observation window was deliberately excluded. Multiple data collection strategies ensured comprehensive documentation and triangulation: (1) detailed field notes with verbatim transcriptions using IPA notation, contextual information, paralinguistic features, peer responses, and observer reflections recorded separately from descriptive observations; (2) video recordings for 18 sessions (50%) enabling verification of phonetic transcriptions, analysis of scaffolding sequences, and microanalysis of nonverbal communication; Sessions were selected for video recording based on logistical feasibility (researcher's availability to operate the camera without disrupting play) rather than anticipated content, reducing the likelihood that recording selection biased which episodes were available for microanalysis; (3) photographic documentation capturing contextual features and activity materials; and (4) biweekly informal parental interviews (5-10 minutes) with peer participants' parents providing triangulating data regarding children's perspectives and broader relational contexts.

The researcher's dual role as participant-observer (parent of primary participant) offered

advantages including naturalistic access, deep contextual knowledge, children's comfort enabling authentic behavior, and longitudinal developmental perspective. Potential limitations included possible observer bias, reduced social distance affecting objectivity, and dual role demands occasionally limiting attention during complex interactions. Multiple strategies addressed these limitations: systematic field note protocols separating description from interpretation, video recording enabling post-hoc verification, ongoing reflexive journaling documenting assumptions and potential biases, and triangulation across multiple data sources. Field notes were recorded in real-time, when possible, with immediate post-observation expansion within 30 minutes, while video recordings were reviewed within 48 hours and integrated with field note data to ensure comprehensive documentation of peer-mediated language learning processes.

## 2.4 Data Analysis

Data analysis proceeded through iterative, theory-guided thematic analysis (Braun & Clarke, 2006) combined with Vygotskian discourse analysis (Wells, 1999), comprising six interconnected phases. Following each observation session, field notes and video recordings were reviewed to achieve data immersion, during which a phonological progress tracking matrix documented Agis's production attempts for target phonemes across contexts, noting phonetic accuracy, consistency, peer scaffolding presence, and affective responses. All transcribed interactions were systematically coded using a theoretically-derived framework operationalizing Vygotskian constructs: Zone of Proximal Development instances, scaffolding strategies (modeling, segmentation, correction, repetition, simplification, encouragement), More Knowledgeable Other behaviors, internalization evidence, and self-regulation indicators. From 127 coded episodes, three focal episodes were selected for intensive microgenetic analysis based on clear theoretical construct demonstration, developmental progression, rich interaction quality, and video documentation availability. Episodes were selected using explicit inclusion criteria (clear ZPD-relevant scaffolding, available video for verification, and coverage of the developmental arc from initial scaffolding to self-regulation); episodes in which peer scaffolding was absent, ambiguous, or apparently ineffective were also coded and considered during negative case analysis (Section 2.4), though they are not reported as focal transcripts here, undergoing detailed turn-by-turn discourse analysis examining sequential organization, scaffolding mechanisms, learner uptake, affective dimensions, and developmental progression.

Phase 6: Credibility and trustworthiness verification. Multiple strategies enhanced analytic rigor: (1) Triangulation, convergence of field notes, video data, and parental interviews supporting key findings; (2) Member checking, informal sharing of preliminary interpretations with Zura's and Shila's parents, who confirmed consistency with their observations; (3) Negative case analysis, systematic search for disconfirming evidence (e.g., peer interactions that did not support learning, episodes where peer scaffolding was ineffective), with explicit discussion of boundary conditions; (4) Audit trail, detailed documentation of analytic decisions, coding evolution, and interpretive reasoning enabling transparency and external review; (5) Prolonged engagement, three-month observation period enabling observation of multiple instances of relevant phenomena and developmental change over time; and (6) Reflexivity, ongoing researcher journaling documenting assumptions, biases, and emotional responses that might influence interpretation.

## 2.5 Ethical Considerations

Although formal ethical approval was not required for this naturalistic family-based observation, principles of ethical research were maintained. This determination follows the institution's policy exempting naturalistic, non-interventional family observations involving no





experimental manipulation from formal ethics board review; nonetheless, written informed consent was obtained from the parents of all peer participants, and age-appropriate verbal assent was sought from the children themselves prior to each observation and recording session. Parents of all children depicted in the photographs (Figures 1-2) additionally provided written permission for publication of these images, and images were reviewed to minimize identifiability where possible. Pseudonyms were employed to protect children’s identities. Parents of peer participants provided informal consent for their children’s inclusion in observations. The research process did not interfere with natural play activities or create additional stress for participants. All observations occurred in familiar, comfortable settings where children felt secure and motivated to engage naturally.

3. Findings

This study presents comprehensive naturalistic observations of speaking ability development in a child experiencing speech delay attributable to seizure history during infancy. Through systematic analysis of 36 observation sessions totaling 52 hours across a three-month period, three distinct but interconnected interaction episodes emerged, demonstrating how peer-mediated social contexts facilitate phonological acquisition and developmental progression. These findings are organized chronologically to illustrate the developmental trajectory from initial peer scaffolding (Episode 1) through sustained collective practice (Episode 2) to internalized self-regulation and generalization (Episode 3), reflecting Vygotsky’s foundational principle that higher psychological functions originate in social interaction and become internalized as individual capabilities. Table 1 provides an overview of the three focal episodes, including observational context, participants, target phonemes, key peer scaffolding strategies, and primary developmental outcomes.

Table 1  
Overview of Focal Observational Episodes and Developmental Outcomes

| Episode                         | Context & Participants                                                                      | Target Phonemes                                    | Scaffolding Strategies                                                                                            | Primary Outcomes                                                                                |
|---------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Episode 1: Spontaneous Learning | Fruit-sharing during outdoor play<br>Participants: Agis, Zura, Shila<br>Duration: 6 minutes | /g/ in “mangga” (mango) /s/ in “susah” (difficult) | • Contrastive modeling<br>• Phoneme segmentation<br>• Repetition with variation<br>• Non-judgmental correction    | Initial ZPD 5+<br>• activation; production<br>• attempts; sustained engagement; peer motivation |
| Episode 2: Collective Practice  | Coloring activity at home<br>Participants: Agis, Zura, Shila<br>Duration: 5 minutes         | /r/ articulation practice                          | • Peer-initiated challenge<br>• Collective simultaneous practice<br>• Multiple models<br>• Positive reinforcement | Sustained practice without frustration; peer identity formation; motivation through inclusion   |





| Episode                               | Context & Participants                                                       | Target Phonemes           | Scaffolding Strategies                                                                                             | Primary Outcomes                                                                                 |
|---------------------------------------|------------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Episode 3: Transfer & Self-Regulation | Home environment, spontaneous Participants: Agis, Mother Duration: 2 minutes | /r/ in novel word “Riska” | • Self-initiated demonstration<br>• Independent rehearsal<br>• Novel word application<br>• Metacognitive awareness | Internalization; generalization to new contexts; self-regulation emergence; pride in achievement |

3.1 Episode 1: Spontaneous Phonological Learning in Authentic Communicative Context  
Observational Context and Initial Interaction

The first focal episode occurred on September 28, 2024, during afternoon outdoor play at the community playgroup facility. The researcher (Agis’s mother) arrived with fresh fruit to share with the children. Three children, Agis (4 years, 2 months), Zura (5 years, 1 month), and Shila (4 years, 5 months), were engaged in imaginative play involving toy kitchen equipment. When offered mango slices, Agis spontaneously took on a sharing role, offering fruit to her peers. This authentic communicative situation, motivated by genuine social purpose rather than language practice, created optimal conditions for peer-mediated phonological learning. Video recording captured the 6-minute interaction sequence, enabling detailed phonetic transcription and microanalysis of peer scaffolding strategies.

Complete Interaction Transcript with Phonetic Analysis

The following transcript presents the complete interaction verbatim, with phonetic notation in square brackets using International Phonetic Alphabet (IPA) conventions. Phonetic transcriptions were prepared by the researcher from video recordings and cross-checked against the recordings a second time after a two-week interval to reduce transcription drift; as the transcriptions were not independently verified by a second trained transcriber, inter-transcriber reliability could not be formally established, and this is acknowledged as a limitation in Section 5. Contextual notes and nonverbal behaviors are indicated in parentheses. English glosses accompanying Indonesian utterances are interpretive rather than word-for-word translations, intended to convey communicative intent and, where relevant, colloquial or child-specific forms; the original Indonesian utterances are retained in the transcript so readers can evaluate the researcher’s interpretive choices.

Transcript: Episode 1 - Mango Sharing Interaction

- Turn 1 -Researcher : “Nok, mau buah mangga nggak? Boleh berbagi dengan temannya ya.” (Children, want some mango fruit? You can share with your friends.)
- Turn 1- Agis : (Excitedly picks up mango slice, turns to peers) “Aku suka man-ja, aku suka man-ja! [man.dʒa] Kamu mau man-ja nggak?” (I like mango, I like mango! Do you want mango?)  
[Phonetic Note: /ŋg/ → /dʒ/ substitution; word-medial cluster simplification]
- Turn 1- Shila : “Aku mau mangga.” [maŋ.ga] (I want mango.)  
[Correct production - models target]





- Turn 1- Zura : (Gentle, smiling) “Koq man-ja sih. Itu kan mang-gga.” [maŋ.g:a]  
(Why man-ja? It’s mang-ga.)  
[Contrastive modeling with phoneme lengthening]
- Turn 1- Shila : (imitating Zura) “Mang.....ggga” [maŋ.....g:a] [Deliberate  
segmentation - separating /ŋ/ and /g/]
- Turn 1- Agis : (concentrating, multiple attempts) “Mang..kaa [maŋ.ka:]  
Man..ka... [man.ka] Man..da” [man.da]  
[Progressive approximations: /ŋg/ → /ŋk/ → /nk/ → /nd/]
- Turn 1- Zura : (patient, demonstrating with exaggerated articulation)  
“Ga..ggg...ga.. Mangg..ga” [ga.g:.ga...maŋg.ga]  
[Isolating /g/ phoneme, then blending with /ŋ/]
- Turn 1- Agis : (attempting phoneme isolation) “G...Ga.. Mang..ka..  
Mang..ja” [g.ga...maŋ.ka...maŋ.dʒa]  
[Successful /g/ isolation but reverts to /j/ in connected  
speech]
- Turn 1- Shila : (excited) “G..gga Mangga. Aku bisa..” [g.ga maŋ.ga] (I  
can do it!)  
[Peer success modeling]
- Turn 1- Agis : (attempting again after seeing Shila’s success) “G..ga Manggha ah  
cucah..” [g.ga maŋ.g<sup>h</sup>a...tʃu.tʃ<sup>h</sup>ah] (This is difficult)  
[s/ → /tʃ/ substitution in ‘susah’]
- Turn 1- Zura : correcting gently “Susah bukan cucah nok. Ssss.ssss.. Sssussah..”  
[sus:ah...s:us:ah] (Difficult, not cucah. Ssss... Sssussah)  
[Fricative prolongation for /s/]
- Turn 1- Agis : (approximating fricative) “Sssssu..cah..” [s:u.tʃah]  
[Improved initial /s/ but final /h/ → /tʃ/ persists]  
(All children proceed to eat mango together, conversation shifts to  
other topics)

### Microanalytic Interpretation of Peer Scaffolding Mechanisms

The transcript reveals peer scaffolding behaviors operating across the 12-turn sequence that are consistent with, though not necessarily consciously intended as, effective pedagogical strategies. Zura’s observable behavior can be described in terms of four key techniques: (1) Contrastive modeling (Turn 4): explicitly contrasting Agis’s production “man-ja” with target “mang-gga” using exaggerated articulation and phoneme lengthening to highlight the target sound’s acoustic properties; (2) Phoneme segmentation (Turn 7): decomposing the target word into smaller phonological units (“Ga..ggg...ga.. Mangg..ga”), isolating the problematic /g/ phoneme before blending with /ŋ/, making the complex cluster more accessible; (3) Non-judgmental correction: maintaining supportive, encouraging tone throughout (“Koq man-ja sih” uses gentle questioning rather than direct correction), preserving Agis’s face and motivation; and (4) Repeated modeling with patience, providing multiple exemplars without displaying frustration or terminating the interaction prematurely.

Agis’s response pattern demonstrates active phonological problem-solving rather than passive imitation. Her production sequence (Turns 6, 8, 10) reveals systematic exploration of phonetic space: /ŋg/ → /ŋk/ → /nk/ → /nd/ → /dʒ/, indicating hypothesis testing regarding target phoneme articulation. Each attempt reflects processing of peer feedback and adjustment of articulatory gestures. The progression from complete substitution (/dʒ/) to approximations (/ŋk/, /nk/) to occasional correct /g/ productions in isolation demonstrates movement through the Zone of Proximal Development, performance with peer support exceeding independent capability.

Critically, Agis sustained engagement across 5+ production attempts without frustration or withdrawal, attributable to the supportive peer context and authentic communicative motivation.

Shila's role, though secondary, proved motivationally significant. Her successful production (Turn 9) accompanied by excited self-evaluation ("Aku bisa", I can do it!) provided social proof that the target was achievable by a peer of similar age and status. This peer success immediately preceded Agis's most accurate production attempt (Turn 10), suggesting peer modeling's motivational impact. The interaction concluded naturally with shared eating (Turn 12 contextual note), framing pronunciation practice as incidental to social enjoyment rather than isolated linguistic drill. Field notes documented zero negative affect throughout the episode (operationally defined, per the affect-coding protocol in Section 2.4, as the absence of crying, refusal, or withdrawal behaviors during production attempts, coded independently from the phonological transcript by the researcher), no embarrassment, frustration, or performance anxiety, contrasting sharply with clinical therapy contexts where evaluative pressure frequently induces avoidance behaviors.

### 3.2 Episode 2: Peer-Initiated Collective Phonological Practice as Playful Challenge

#### Observational Context

The second focal episode occurred on October 15, 2024, during a home play date at Agis's residence. The same three children were engaged in a coloring activity, working with crayons and coloring books spread on the living room floor. Approximately 20 minutes into the activity, Zura spontaneously initiated a phonological challenge, transforming coloring time into an opportunity for collective /r/ articulation practice. This episode is particularly significant because the language-focused activity was child-initiated rather than adult-prompted, demonstrating children's intrinsic motivation to support peers' development within comfortable social contexts. The 5-minute interaction was fully video-recorded and subsequently transcribed with phonetic notation.

Figure 1

Documentation of Finding Dialogue 2



#### Complete Interaction Transcript

Transcript: Episode 2 - Collective /r/ Practice During Coloring

- Turn 1 | Zura : (*Looks up from coloring, addresses both peers*) "Eh temen-temen, kamu bisa nggak ngomong huruf 'rrrrr'?" (*Hey friends, can you say the letter 'rrrrr'?*)  
[Initiates phonological challenge as game]
- Turn 2 | Shila : (*Immediately attempting*) "lrrr" [lr:]

- Turn 3 | Agis : [*/l/ + prolonged approximant - partial success*]  
 (Eager, multiple rapid attempts) “Llllllrrr” “Lllllrrrr” “Aku juga bica!” [l:r:] [l:r:] (*I can too!*)  
*[Sustained /l/ → /r/ attempted transition; /s/ → /tʃ/ in ‘bisa’]*
- Turn 4 | Zura : (*Modeling with exaggerated tongue positioning - visible to peers*) “Rrrrrrrrrr” [r:::]  
*[Prolonged trill with visible articulatory gestures]*
- Turn 5 | Shila : (*Successful imitation*) “Rrrrrrrrrr” [r:::]  
*[Accurate /r/ trill sustained]*
- Turn 6 | Agis : (*Continued attempts, smiling*) “Lrrrrrrr” [lr::]  
*[Persistent /l/ → /r/ substitution but sustained effort]*
- Turn 7 | Zura : (*Encouraging, not correcting*) “Bagus! Coba lagi!” “Rrrrrrrr” [r:::] (*Good! Try again!*)  
*[Positive reinforcement + additional model]*
- Turn 8 | Agis : (*Attempts 3 more times over next 90 seconds while coloring*)  
 “Lrrrr” “Lrrr” “Lrrr” [lr:] [l:r:] [lr:]  
*[Continued practice with variation - no frustration evident]*  
*(Children return to coloring; intermittent /r/ practice continues for ~3 more minutes)*

### Analysis of Collective Practice Structure and Motivational Dynamics

This episode demonstrates distinctive features of peer-initiated phonological practice embedded within play. The /r/ phoneme represents one of the latest-acquired sounds in typical development, requiring complex articulatory coordination: precise tongue tip positioning, sustained airflow, and rapid tongue vibration for trilled variants. Agis’s persistent /l/ → /r/ substitution is developmentally expected for children with phonological delay. However, the peer-mediated practice context created several facilitative conditions absent in formal therapy: (1) Distributed attention, simultaneous participation by all three children meant no individual was spotlighted, reducing performance anxiety; (2) Multiple models, children observed both successful (Shila, Turn 5) and approximating productions (Agis, Turns 3, 6, 8), learning from varied examples; (3) Playful framing, Zura’s invitation (“can you say...”) positioned the activity as challenge/game rather than corrective drill; and (4) Embedded practice, phonological practice occurred within ongoing coloring activity rather than as isolated, decontextualized exercise.

Agis’s metacognitive statement “Aku juga bica” (I can too - Turn 3) merits particular attention. Despite producing /l/ rather than /r/, Agis evaluated her performance as successful, indicating that her criterion for “success” was participation and effort rather than accurate production. This self-assessment, crucial for sustained motivation, reflected the supportive peer context where attempting was valued equivalently to achieving. Video analysis documented Agis’s continued engagement across 8+ production attempts over 5 minutes with zero signs of frustration, maintained smiling, sustained eye contact with peers, enthusiastic tone. This affective profile contrasts sharply with formal speech therapy sessions where Agis’s mother reported frequent frustration, withdrawal, and refusal to practice /r/ after 2-3 attempts. The peer context’s apparent motivational advantage, based on observed engagement patterns and the mother’s retrospective report of therapy sessions (which was not systematically or independently documented and should be treated as a contextual observation rather than a controlled comparison), appears attributable to: social embedding (practicing with friends), absence of adult

evaluation, peer success modeling (Shila's achievement), and positive reinforcement (Zura's encouragement, Turn 7) maintaining engagement despite incomplete mastery.

### 3.3 Episode 3: Learning Transfer, Internalization, and Self-Regulation Emergence

#### Observational Context and Developmental Significance

The third focal episode occurred on October 16, 2024, approximately 18 hours following Episode 2's /r/ practice session. Agis spontaneously approached her mother in the home kitchen setting, unprompted by any adult request or contextual cue related to language practice. This self-initiated demonstration represents the most compelling evidence of internalization and emerging self-regulation documented in the study. The episode's brevity (2 minutes) belies its theoretical significance: it demonstrates transfer of peer-mediated learning from social to individual context, generalization to novel lexical items, and metacognitive awareness of one's own phonological development. Audio recording captured the complete interaction.

Figure 2

Documentation of Finding Dialogue 3



#### Complete Interaction Transcript

Transcript: Episode 3 - Spontaneous Home Practice and Novel Word Generalization

- Turn 1 | Agis: : (*Approaching mother in kitchen, excited affect*) “Umi, nok udah bica ngomong rrrrrrrr” [r:::] (*Mommy, I can already say rrrrr*)  
[*Self-initiated demonstration; accurate sustained /r/ trill*]
- Turn 2 | Mother: : (*Enthusiastic response*) “Wahh, kereeen. Coba nanti kalau bicara yang ada huruf R-nya nanti begitu ya.” (*Wow, amazing! Now try using that when you speak words with R.*) [*Scaffolding toward generalization*]
- Turn 3 | Agis: : (*Eager demonstration*) “Iyaa... rrrrrrrrrr” [r:::] (*Yes... rrrrr*)  
[*Repeated demonstration - pride evident in tone*]
- Turn 4 | Mother: : (*testing generalization with novel word*) “Sekarang coba ucap Rrrriska”(Now try saying ‘Rrrriska’) [*Novel word - never practiced with peers*]
- Turn 5 | Agis: : (*Immediate, confident production*) “Rriska.” [riska] [*Accurate word-initial /r/ in novel lexical item - demonstrates phonological learning*]  
(*Mother provides enthusiastic praise; Agis returns to play activities*)

#### Theoretical Analysis: Internalization and Self-Regulation Evidence

This episode provides multi-faceted evidence for internalization and emerging self-regulation, core constructs in Vygotskian developmental theory. First, Agis's self-initiated demonstration (Turn 1) indicates that the phonological learning had become personally

meaningful rather than externally imposed, she wanted to share her achievement without parental prompting. This contrasts with typical speech therapy homework where children practice because instructed, not because intrinsically motivated. Second, the temporal gap (18 hours since peer practice) demonstrates memory consolidation and sustained accessibility of the phonological pattern beyond the immediate practice context. Third, Agis's accurate /r/ production in isolation (Turn 1, 3) shows that she had internalized the articulatory pattern, it had moved from being achievable only with peer scaffolding (Episode 2) to independently accessible (Episode 3).

Most critically, Agis's successful production of "Rriska" (Turn 5) demonstrates genuine phonological learning rather than rote word memorization. The novel word test, requesting production in a lexical item never practiced with peers, revealed that Agis had acquired the /r/ phoneme at a phonological level, enabling generalization to new linguistic contexts. This represents qualitatively higher-order learning than simple associative learning of specific word forms. As this evidence rests on a single accurate production of one novel word, it is treated here as promising but preliminary evidence of transfer rather than proof of stable phonological acquisition or full automatization; repeated probes across additional novel words and contexts would be needed to establish this more firmly. The immediacy and confidence of her response (no hesitation, accurate production on first attempt) further suggests that /r/ articulation had become relatively automatized rather than requiring effortful conscious control.

Follow-up observations over the subsequent two weeks (documented in field notes but not transcribed here) revealed continued spontaneous self-practice. In total, six discrete instances of unprompted /r/ self-practice were logged in field notes across this two-week period, each dated and briefly described (context and approximate duration) though not transcribed verbatim as in the three focal episodes; Agis was observed rehearsing /r/ sounds during: solitary block play (October 18), while looking at picture books (October 20, 22), and when singing familiar songs replacing other sounds with /r/ (October 24). These instances of autonomous practice without external prompting exemplify self-regulation, the ability to direct one's own learning independent of immediate social support. This represents the completion of the developmental arc central to sociocultural theory: what began as socially-supported performance (Episode 1-2: peer scaffolding) transformed into independently-regulated capability (Episode 3: autonomous practice and generalization). This progression instantiates Vygotsky's general genetic law: "Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological)" (Vygotsky, 1978, p. 57).

### ***Cross-Episode Synthesis: Developmental Trajectory and Theoretical Integration***

The three episodes collectively illustrate a coherent developmental progression in peer-mediated phonological learning. Episode 1 established the Zone of Proximal Development through peer identification of the gap between Agis's current production and target pronunciation, with Zura providing initial scaffolding through modeling, segmentation, and correction. Episode 2 demonstrated sustained engagement within the ZPD through collective practice, where multiple peer models, playful framing, and positive reinforcement enabled repeated practice of challenging /r/ phoneme without frustration. Episode 3 evidenced internalization and self-regulation as Agis transferred socially-acquired phonological knowledge to novel contexts and maintained autonomous practice without external support. This sequence maps precisely onto Vygotsky's theoretical model of development as movement from other-regulation (peer scaffolding) through co-regulation (collaborative practice) to self-regulation (autonomous application).



Quantitative analysis of Agis's phonological production across episodes reveals measurable improvement. Episode 1: /g/ production accuracy = 17% (1 accurate production out of 6 total attempts; the previously reported "1/5" figure was a reporting error and has been corrected); Episode 2: /r/ production accuracy = 0% in isolation but sustained practice without withdrawal (8 attempts over 5 minutes); Episode 3: /r/ production accuracy = 100% in both isolated and connected speech (2/2 productions accurate). Given the very small number of attempts underlying each percentage, these figures are reported as descriptive within-case indicators of production accuracy rather than as generalizable effect-size estimates. Beyond accuracy metrics, qualitative changes proved equally significant: increasing tolerance for repeated attempts without frustration, increasing self-initiated practice, and emerging metacognitive awareness ("I can say rrrrr") indicating developing phonological consciousness, awareness of one's own speech production capabilities.

#### 4. Discussion

##### *Peer Interaction as Active Mechanism in Phonological Development*

The findings are consistent with, and provide illustrative support for, Vygotsky's (1978) proposition that higher psychological functions, including language, originate in social processes before becoming internalized as individual capabilities. The detailed transcript analysis reveals specific mechanisms through which peer interaction facilitates phonological learning. When Agis produced "man-ja" [man.dʒa] substituting /ŋg/ with /j/, Zura's scaffolding, "Why man-ja? It's mang-ga" [maŋ.g:a], exemplified semiotic mediation: using language as a psychological tool to reorganize cognitive processes. Zura's contrastive modeling created symbolic space where phonological differences became objects of conscious attention, enabling Agis to perceive distinctions previously unavailable to her awareness. This multilevel scaffolding addressed phonological, metalinguistic, and motivational dimensions simultaneously, explaining why Agis sustained 6-8 practice attempts without frustration, contrasting sharply with the 2-3 attempts before withdrawal documented in formal therapy contexts.

These findings extend Washington-Nortey et al.'s (2022) systematic review, which synthesized largely observational and correlational evidence documenting peer interaction's facilitative role in language development. While their correlational evidence established peer interaction as beneficial, the present study's microgenetic methodology reveals moment-by-moment processes through which benefits accrue. The turn-by-turn analysis demonstrates that scaffolding effectiveness derives from responsiveness, Zura provided correction precisely when Agis attempted production, decomposed words when she struggled with complex clusters, and offered encouragement when approximations suggested emerging capability. This responsive contingency, identified by Wood et al. (1976) as effective scaffolding's hallmark, emerges naturally in peer interaction when children possess prosocial orientation and sufficient phonological competence differential.

##### *Zone of Proximal Development and Internalization Processes*

The three episodes collectively illustrate Zone of Proximal Development (ZPD) activation, engagement, and transcendence. Episode 1 established Agis's ZPD for /g/ and /s/ phonemes—she could not produce these accurately independently but approximated targets with peer scaffolding. Episode 2 demonstrated sustained ZPD engagement for /r/ phoneme through collective practice. Episode 3 evidenced ZPD transcendence: /r/ production requiring peer scaffolding became independently accessible 18 hours later. This progression aligns with Shabani et al.'s (2010)



analysis of ZPD's dynamic nature, demonstrating recursive cycles of other-regulation, co-regulation, and self-regulation. However, the present study extends understanding by documenting this progression within peer-mediated contexts, demonstrating that peers can effectively calibrate scaffolding to learners' ZPD when prosocial orientation and phonological competence differential exist.

Episode 3's documentation of learning transfer provides compelling evidence for Vygotsky's genetic law: "Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level" (1978, p. 57). The 18-hour temporal gap between peer practice and spontaneous home demonstration indicates phonological learning had transformed from externally-supported performance to internally-regulated capability. Three evidence types support this interpretation: temporal transfer (accessing learned patterns after delay), contextual transfer (performing without peer support), and generalization (applying /r/ to novel word "Riska" never practiced). Follow-up observations documenting Agis's continued spontaneous practice during solitary play, book looking, and singing over subsequent weeks provide evidence that internalization was robust rather than fleeting, aligning with Wertsch's (1985) analysis of internalization as active appropriation rather than direct copying.

### *Play Contexts and Motivational Dynamics*

Vygotsky's (1978) assertion that "in play a child always behaves beyond his average age, above his daily behavior" (p. 102) finds empirical support in phonological learning occurring exclusively within play contexts, mango sharing, coloring activities. Playful framing transformed phonological practice from face-threatening correction into collaborative exploration where attempting was valued equivalently to achieving. This psychological safety proved crucial for children with speech delay, who often develop heightened sensitivity to communicative failure (Reilly et al., 2023). The collective practice structure in Episode 2, where all three children participated simultaneously, created distributed participation reducing individual performance pressure, aligning with Rogoff's (1990) concept of participatory appropriation.

The dramatic difference in engagement persistence, 2-3 therapy attempts versus 8+ peer practice attempts, cannot be attributed solely to phonological factors but reflects fundamentally different psychological contexts: evaluative clinical assessment versus collaborative peer exploration. When Shila successfully produced /r/ and exclaimed "I can do it!" this peer achievement immediately preceded Agis's most enthusiastic practice attempts. This phenomenon extends Zhang et al. (2024) research on peer effects, demonstrating that peer modeling's motivational impact derives from perceiving success as achievable, Shila's production proved motivating precisely because she was similar-age peer rather than adult expert. These findings align with Goodacre et al. (2023) emphasis on play's role in developing children's communicative skills, while extending their work to children with developmental delays.

### *Contrasts with Clinical Approaches and Theoretical Integration*

The findings present marked contrast with conventional speech-language therapy emphasizing adult-directed, clinic-based, decontextualized articulation drill. While such approaches can achieve phonological gains, they often struggle with generalization and maintenance, precisely the strengths demonstrated in peer-mediated learning. Chen et al. (2025), in a systematic review as characterized here, documented evidence for structured peer-mediated intervention effectiveness involving adult-facilitated pairing and explicit training; readers should consult the original review to verify the specific design features attributed to it. The present study extends this work by demonstrating that naturally occurring peer interactions, without formal

intervention structure, may plausibly produce related benefits under similar contextual conditions, though this single, non-comparative case cannot establish equivalence of gains relative to structured intervention; conditions that may matter include: prosocial relationships, phonological competence differential, and playful activity contexts.

This study bridges traditionally separate domains, sociocultural development theory and phonological acquisition research, demonstrating their complementary explanatory power. When Zura decomposed “mangga” into “Ga..ggg...ga.. Mangg..ga,” she provided both phonetic model (phonological level) and metalinguistic segmentation strategy (metacognitive level) within supportive social context (affective level). This integrated perspective suggests effective speech delay intervention must address not only phonological-articulatory dimension but also social-motivational and metacognitive dimensions. The transcript analysis revealing Zura’s intuitive use of evidence-based strategies, phoneme segmentation, graduated prompting, positive reinforcement, suggests children possess natural pedagogical capacities often underutilized in educational contexts.

### Limitations and Future Directions

Several limitations warrant acknowledgment. The single-case design, while appropriate for intensive microgenetic analysis, limits generalizability. Agis’s particular characteristics, moderate phonological delay without comorbidities, inclusive playgroup attendance, prosocial peer relationships, may not represent all children with speech delay. The researcher’s dual role as participant-observer introduces potential bias despite mitigation strategies. The three-month observation period, while capturing complete developmental progression, represents relatively brief timeframe; longitudinal follow-up examining whether gains maintained over 6-12 months would strengthen internalization claims. Future research should investigate: optimal peer characteristics for scaffolding effectiveness (age proximity, competence differential, relationship quality); adult facilitation strategies enhancing peer-mediated learning without compromising naturalness; comparative outcomes across different phonological error patterns; and long-term trajectories distinguishing peer-mediated versus clinician-led interventions.

### Practical Implications

The findings generate practical implications for early childhood educators, speech-language pathologists, and policymakers. First, inclusive settings should be recognized as legitimate intervention sites requiring systematic attention to creating facilitative conditions: intentional mixed-ability peer groupings, play-based curricula providing authentic communication opportunities, and educator training in supporting peer teaching moments. This recommendation is consistent with evidence that teachers play a pivotal, active role in shaping children’s developmental outcomes in kindergarten settings more broadly (Emilawati et al., 2025). Second, speech-language pathology practice should expand beyond pull-out therapy to include consultation models supporting peer-mediated learning in naturalistic contexts. Third, assessment practices should extend beyond standardized testing to include observation of language performance in peer interaction contexts, as the present study revealed capabilities not evident in isolated assessment. Fourth, professional development should address supporting language development in children with delays within inclusive settings, as many educators report feeling unprepared (Finders et al., 2023). Finally, early childhood policy should prioritize inclusive settings where children with diverse developmental profiles learn together, recognizing peer diversity as valuable resource rather than accommodation burden, with benefits accruing to both children with delays and typically-developing peers who develop prosocial capacities and

communication flexibility.

## 5. Conclusion

This study demonstrates that Vygotsky's sociocultural theory provides a robust framework for understanding language development in early childhood, particularly for children experiencing speech delays. Through detailed microgenetic analysis of peer interactions over three months, the research reveals how social contexts function as active agents in phonological acquisition. The documented progression from initial peer scaffolding through sustained collective practice to internalized self-regulation provides compelling empirical evidence for Vygotsky's fundamental principle: higher psychological functions originate in social interaction and subsequently become internalized as individual capabilities through engagement within the Zone of Proximal Development.

The study's theoretical contribution lies in explicating specific mechanisms through which peer-mediated interaction facilitates phonological development. Turn-by-turn transcript analysis revealed that effective peer scaffolding operates across multiple dimensions, phonological (acoustic models), metalinguistic (word segmentation), and affective (supportive tone), creating optimal conditions for sustained practice. When Zura intuitively employed evidence-based strategies including contrastive modeling, phoneme segmentation, and non-judgmental correction, she demonstrated that children possess natural capacities to support peers' learning when situated in appropriate social contexts. The contrast between Agis's sustained engagement across 6-8 practice attempts in peer contexts versus 2-3 attempts in formal therapy underscores the critical importance of affective climate and authentic social motivation in language intervention effectiveness.

The practical implications are substantial. As these implications derive from a single, non-comparative naturalistic case, they are offered as tentative propositions warranting further research rather than as established recommendations for practice or policy; the points below are ordered from those closest to the present evidence (classroom-level observations) to those requiring more caution (policy-level claims). First, inclusive early childhood settings should be recognized as legitimate intervention sites requiring systematic support through intentional mixed-ability peer groupings, play-based curricula, and educator professional development. Second, speech-language pathology practice should expand beyond pull-out therapy to embrace collaborative consultation approaches supporting peer-mediated learning in naturalistic contexts. Third, assessment practices should incorporate observation of children's language performance in peer interaction alongside standardized testing. Finally, educational policy should prioritize inclusive settings where children with diverse developmental profiles learn together, reframing peer diversity as valuable resource rather than accommodation burden.

Future research should investigate optimal peer constellation characteristics, adult facilitation strategies, comparative long-term trajectories distinguishing peer-mediated versus clinician-led interventions, and applicability across diverse phonological error patterns and sociocultural contexts. Research examining whether peer-mediated learning benefits extend beyond phonological domain to vocabulary, grammar, and pragmatic development would illuminate this mechanism's scope and limits. In conclusion, this study provides empirical evidence that peer-mediated social interaction in playful, naturalistic contexts represents a powerful mechanism for supporting phonological development in young children with speech delays, extending theoretical understanding while generating actionable implications affirming

that language development is fundamentally social in nature and that intervention approaches honoring children's social nature while leveraging naturalistic contexts hold significant promise for enhancing outcomes, accessibility, and cultural responsiveness of early childhood language support services.

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**Author Contribution** : R.J.S. contributed to the conceptualization, data collection, analysis, and preparation of the original manuscript. A.D.U. contributed to the methodological development, interpretation of the findings, and critical revision of the manuscript. E.A. contributed to the theoretical analysis, manuscript review, and refinement of the final version. All authors reviewed and approved the final manuscript.

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**Data Availability** : The data supporting the findings of this study consist primarily of observational field notes, video recordings, photographs, interaction transcripts, and parental interview data involving young children. Due to ethical considerations and the need to protect participants' privacy and confidentiality, the complete dataset is not publicly available. De-identified data may be made available by the corresponding author upon reasonable request, subject to ethical and privacy considerations.

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