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# Enhancing Questioning Skills in Preschool Children with Speech Delays Through Project-Based Learning

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**Abstract**
Speech delays affect 5-10% of preschool children and significantly impact questioning skill development, which is essential for cognitive growth and academic success. This study investigated the effectiveness of project-based learning in enhancing questioning competencies among kindergarten children with speech delays. A classroom action research design following Kemmis and McTaggart's spiral model was implemented across three intervention cycles with two kindergarten students (aged 4-6 years) diagnosed with speech delays in East Kalimantan, Indonesia. Data collection employed structured observation rubrics assessing questioning behaviors across four dimensions: question initiation frequency, complexity, contextual appropriateness, and verbal clarity. Project-based learning activities focused on environmental exploration and geometric shape identification through collaborative maket construction. Quantitative analysis examined pre-post score comparisons, while qualitative data underwent thematic analysis with triangulation across multiple sources. Participants demonstrated substantial improvement in questioning skills, with overall mean scores progressing from 1.55 (baseline) to 3.24 (post-intervention), representing a 109% increase. The most significant improvements occurred in question type diversity (275% increase), question quality (200% increase), and independence in question formulation (216.7% increase). Performance classifications advanced from "beginning to develop" to "developing very well" across all measured competency areas. Both participants achieved age-appropriate questioning competencies by intervention completion. Project-based learning methodology effectively enhanced questioning skills among children with speech delays through authentic learning contexts that stimulated natural inquiry behaviors. The findings support constructivist and experiential learning theories while demonstrating the potential of inclusive pedagogical approaches. These results have significant implications for early childhood education practices, suggesting that strength-based interventions can successfully address communication challenges while promoting collaborative learning and cognitive development.

## INTRODUCTION

Early childhood education represents a critical period for establishing foundational skills that influence lifelong learning trajectories, particularly in the development of communication competencies. During the golden age of development (4-6 years), children experience rapid cognitive, linguistic, social, and emotional growth, making this period essential for targeted educational interventions. Within this developmental framework, questioning skills emerge as fundamental components that facilitate cognitive development, critical thinking, and meaningful social interaction. These skills enable children to seek information, express curiosity, and comprehend their surrounding environment, thereby supporting their overall academic and social success.

Effective oral communication serves as a cornerstone of human development, facilitating social interaction, academic achievement, and cognitive growth throughout the lifespan (Wang et al., 2024). Students who demonstrate strong oral communication abilities are better positioned to engage meaningfully in classroom discussions, express complex concepts, and participate effectively in collaborative learning activities (Bambaeeroo & Shokrpour, 2017). Questioning represents one of the

most common teaching activities and plays a crucial role in educational processes (Clegg, 1987; Filiz, 2007; Sahin, 2013). Teachers recognize that conceptual understanding can be realized and knowledge can be structured during questioning processes (Brualdi, 1998). Furthermore, questions play a significant role in developing critical thinking skills at all educational levels (Şeker & Kömür, 2008), serving as primary tools that teachers and students utilize to achieve pedagogical purposes.

However, a significant proportion of children experience developmental challenges that impede their ability to communicate effectively. Speech delay represents a developmental condition where children fail to achieve age-appropriate language milestones, falling significantly behind their peers in communication abilities (Nelson et al., 2006). Research indicates that language acquisition delays without identifiable underlying causes affect between 2.3% and 19% of preschool children aged 2-5 years (Nelson et al., 2006). The American Speech-Language-Hearing Association reports that approximately 5-10% of preschool children experience speech delays, which can profoundly impact their language, cognitive, and social development (Macias & Twyman, 2011). Children experiencing speech delays demonstrate heightened vulnerability to psychological and behavioral adjustment difficulties during preschool years and beyond (Lu et al., 2020; Schoon et al., 2010). These language development challenges frequently correlate with attention deficits, learning difficulties, and long-term memory impairments (Shiani et al., 2025), while speaking difficulties can manifest as problems expressing thoughts through sound symbols, affecting children's ability to convey information effectively to listeners (Mumtaz, 2019).

Despite the recognized importance of questioning skills in educational contexts, current research reveals significant gaps in addressing these competencies among children with speech delays. Previous studies have demonstrated various approaches to enhancing questioning abilities in typical populations. Hariyanti et al. (2024) implemented problem-based learning integrated with snowball throwing methods to improve questioning skills among high school students. Similarly, Hery et al. (2023) utilized talking stick learning models to enhance questioning competencies in middle school science education, while Isroyati et al. (2022) employed question student have models for elementary Indonesian language instruction. Meldina (2019) investigated learning start with a question strategies in primary education settings, and Siregar (2014) explored question-answer methods in civic education. Additionally, Sunata et al. (2019) examined group resume strategies for improving questioning skills and learning outcomes, while Yulia & Suttrisno (2022) investigated PQ4R learning methods for developing questioning competencies.

While these studies provide valuable insights into questioning skill development, they predominantly focus on typical student populations and conventional educational approaches. A critical knowledge gap exists regarding effective pedagogical strategies specifically designed for children with speech delays, particularly in early childhood settings where these foundational skills are most malleable. This gap is particularly concerning given that traditional teacher-centered approaches often fail to provide the interactive, experiential learning environments that children with speech delays require to develop communication confidence and competencies.

Project-based learning emerges as a potentially transformative pedagogical approach for addressing this challenge. Project-based learning refers to an inquiry-based instructional method that engages learners in knowledge construction by having them accomplish meaningful projects and develop real-world products (Brundiers & Wiek, 2013; Krajcik & Shin, 2023). This approach emphasizes student-centered learning, authentic problem-solving, and collaborative knowledge construction (Maros et al., 2023). Chen & Yong (2019) demonstrate that project-based learning has medium to large positive effects on students' academic achievement compared to traditional education. The methodology promotes cooperation between students while positioning teachers as facilitators rather than primary knowledge transmitters (Greenier, 2020). Furthermore, project-based learning supports critical thinking and problem-solving, interpersonal communication, information literacy, cooperation, and leadership development (Chu et al., 2017), making it particularly suitable for addressing the multifaceted challenges faced by children with speech delays.

This research addresses the identified knowledge gap by investigating whether project-based learning methodologies can effectively enhance questioning skills among preschool children with speech delays. The study aims to examine the implementation of exploration-based project learning in kindergarten settings, analyze the effectiveness of this approach in improving questioning competencies, and identify supporting factors that facilitate successful intervention outcomes. The research holds significant implications for inclusive early childhood education practices, providing educators with evidence-based strategies for supporting children with communication challenges. Furthermore, the findings contribute to the broader understanding of differentiated instruction approaches that accommodate diverse learning needs while promoting active engagement and meaningful learning experiences.

The significance of this research extends beyond immediate educational applications, as enhanced questioning skills in children with speech delays can facilitate improved cognitive development, increased social interaction capabilities, and stronger foundation for future academic success. By demonstrating the potential of project-based learning approaches in addressing communication challenges, this study contributes to the development of more inclusive and effective early childhood education practices that serve all learners, particularly those with special educational needs.

## METHODS

This study employed a classroom action research design following Kemmis and McTaggart's spiral model, characterized by iterative cycles of planning, action, observation, and reflection. The action research approach was selected as it enables systematic investigation of educational practices while simultaneously implementing interventions to improve student outcomes. The research was conducted through multiple cycles to allow for continuous refinement of pedagogical strategies based on empirical observations and data analysis.

The study was conducted at Kindergarten X in Sangatta, East Kalimantan, Indonesia, during the second semester of the 2024-2025 academic year. The research setting involved Group B1 classroom, which provided an inclusive educational environment where children with speech delays could participate alongside typically developing peers. This naturalistic setting was essential for examining the effectiveness of project-based learning interventions within authentic classroom contexts.

The research participants comprised 22 kindergarten students aged 4-6 years enrolled in Group B1, with two children specifically identified as having speech delays serving as primary research subjects. These two children had been previously diagnosed with speech delay by clinical psychologists and child development specialists, exhibiting characteristic difficulties in word articulation, sentence construction, and verbal expression. The selection criteria for primary subjects included clinical diagnosis of speech delay, absence of severe cognitive impairments, and regular attendance in classroom activities. The remaining 20 typically developing children served as classroom context participants, facilitating inclusive learning experiences and peer interaction opportunities essential for language development.

Data collection employed multiple instruments to ensure comprehensive assessment of questioning skill development. The primary instrument was a structured observation rubric designed to assess questioning behaviors across four dimensions: question initiation frequency, question complexity, contextual appropriateness, and verbal clarity. The rubric utilized a four-point Likert scale ranging from minimal demonstration (1) to consistent demonstration (4) of each competency. Content validity was established through expert review by three early childhood education specialists and one speech-language pathologist. Inter-rater reliability was assessed through independent observations conducted by the primary researcher and a trained collaborator, achieving Cohen's kappa coefficient of 0.82, indicating substantial agreement.

Supplementary data collection instruments included semi-structured interview protocols for classroom teachers and parents, photographic documentation of project activities, and audio

recordings of classroom interactions during project implementation. These multiple data sources enabled triangulation to enhance research credibility and provide comprehensive understanding of intervention effectiveness.

Data collection procedures followed a systematic timeline across pre-cycle, implementation cycles, and post-cycle phases. The pre-cycle phase involved baseline assessment of questioning skills through structured observations conducted over five consecutive days. Implementation cycles followed W.H. Kilpatrick's project method stages: project topic determination, project planning, project execution, reporting and presentation, and evaluation and reflection. Each cycle lasted approximately two weeks, with continuous data collection throughout project activities. Audio recordings were conducted during specific project phases to capture verbal interactions and questioning behaviors. Post-cycle assessment replicated pre-cycle procedures to measure intervention outcomes.

Project activities focused on environmental exploration themes, specifically investigating geometric shapes in the school environment. This content area was selected based on kindergarten curriculum standards and its potential to stimulate natural questioning through concrete, observable phenomena. Project implementation incorporated multiple scaffolding strategies specifically designed for children with speech delays, including visual supports, choice-based questioning, modeling techniques, positive reinforcement, and peer interaction facilitation.

Data analysis employed both quantitative and qualitative approaches. Quantitative analysis involved descriptive statistics to examine changes in questioning behavior frequencies and rubric scores across research phases. Pre-post comparisons utilized non-parametric statistical tests appropriate for small sample sizes. Qualitative data from observations, interviews, and audio recordings underwent thematic analysis following Braun and Clarke's six-phase approach: data familiarization, initial code generation, theme identification, theme review, theme definition and naming, and report production. Data triangulation enhanced analysis validity by comparing findings across multiple sources and collection methods.

Ethical considerations included obtaining informed consent from parents and institutional approval from kindergarten administration. Child assent was secured through age-appropriate explanations of research activities. Confidentiality was maintained through pseudonym usage and secure data storage protocols. The research adhered to ethical principles of beneficence, non-maleficence, and respect for persons, ensuring that all interventions supported children's educational development while minimizing potential risks.

## RESULTS AND DISCUSSION

### Results

This action research was conducted across multiple cycles, beginning with a pre-cycle assessment to establish baseline questioning skills, followed by three intervention cycles implementing project-based learning methodologies. Each cycle incorporated systematic data collection through structured observations, questioning skill assessments, and guided dialogue evaluations to monitor participant progress.

#### *Pre-Cycle Assessment Results*

The pre-cycle assessment established baseline questioning competencies for both participants with speech delays. Table 1 presents the quantitative assessment results for questioning skills during the initial evaluation phase.

**Table 1.** Pre-cycle Questioning Skills Assessment Results

| Subject | Question Type | Articulation | Fluency | Total Score | Mean Score | Conversion |
|---|---|---|---|---|---|---|
| A | 0 | 1 | 1 | 2 | 0.67 | BB |
| B | 1 | 2 | 1 | 4 | 1.34 | MB |
| Total | 1 | 3 | 2 | 6 | 1 | BB |

*Note: BB = Belum Berkembang (Not Yet Developed), MB = Mulai Berkembang (Beginning to Develop)*

The pre-cycle results revealed that both participants demonstrated limited questioning capabilities across all measured dimensions. Subject A achieved an overall mean score of 0.67, categorized as "not yet developed," while Subject B obtained a mean score of 1.34, classified as "beginning to develop." These findings indicated significant deficits in questioning skill development, particularly in question formulation, articulation clarity, and response fluency.

Qualitative observations during pre-cycle guided dialogue sessions further confirmed these quantitative findings. Table 2 summarizes the observational data from structured dialogue activities.

**Table 2.** Pre-cycle Guided Dialogue Observation Results

| Subject | Quality | Response | Support | Total Score | Mean Score | Conversion |
|---|---|---|---|---|---|---|
| A | 2 | 1 | 1 | 4 | 1.34 | MB |
| B | 2 | 2 | 2 | 6 | 2 | MB |
| Total | 4 | 3 | 3 | 10 | 1.67 | MB+ |

During pre-cycle center-based learning activities, both participants exhibited limited engagement and minimal spontaneous questioning behaviors. Subject A frequently sought play activities rather than participating in structured learning tasks, while Subject B demonstrated task completion abilities but required substantial instructional support and showed minimal peer interaction.

***Cycle 1 Implementation Results***

The first intervention cycle implemented project-based learning activities focused on school environment exploration through maket construction projects. Participants engaged in project topic selection, planning phases, and initial construction activities across two instructional sessions.

Questioning skills assessments conducted during Cycle 1 demonstrated measurable improvements across multiple competency areas. Table 3 presents the quantitative results for questioning skill development.

**Table 3.** Cycle 1 Questioning Skills Assessment Results

| Meeting | Subject | Question Type | Articulation | Fluency | Total Score | Mean Score | Conversion |
|---|---|---|---|---|---|---|---|
| 1 | A | 2 | 1 | 2 | 5 | 1.67 | MB |
| | B | 3 | 2 | 2 | 7 | 2.34 | BSH |
| 2 | A | 2 | 1 | 2 | 5 | 1.66 | MB |
| | B | 3 | 2 | 2 | 7 | 2.33 | BSH |
| Total | | 10 | 6 | 8 | 24 | 2 | MB+ |

*Note: BSH = Berkembang Sesuai Harapan (Developing as Expected)*

The first cycle results indicated progressive improvement in questioning capabilities. Subject B achieved consistent "developing as expected" ratings across both sessions, while Subject A maintained "beginning to develop" classifications with evidence of gradual advancement. Notably, both participants demonstrated enhanced question type diversity, progressing from simple identification queries to more exploratory questioning patterns.

Observational data from guided dialogue sessions during Cycle 1 revealed additional developmental progress. Table 4 summarizes these qualitative assessment results.

**Table 4.** Cycle 1 Guided Dialogue Observation Results

| Meeting | Subject | Quality | Response | Support | Total Score | Mean Score | Conversion |
|---|---|---|---|---|---|---|---|
| 1 | A | 1 | 1 | 1 | 3 | 1 | BB |
| | B | 2 | 2 | 2 | 6 | 2 | MB |
| 2 | A | 2 | 1 | 2 | 5 | 1.66 | MB |
| | B | 3 | 2 | 2 | 7 | 2.34 | BSH |
| Total | | 8 | 6 | 7 | 21 | 1.75 | MB+ |

During project-based activities, both participants demonstrated increased engagement levels and collaborative behaviors. Subject A showed improved active participation, while Subject B consistently achieved "developing as expected" performance across all measured dimensions. The project context appeared to stimulate natural questioning behaviors, with participants asking functional questions related to material selection, construction techniques, and peer collaboration.

***Cycle 2 Implementation Results***

The second intervention cycle continued project implementation through construction completion and progress monitoring phases. This cycle emphasized question type diversification, incorporating "how" and "why" question formats to promote exploratory and creative thinking skills.
Questioning skills assessments during Cycle 2 demonstrated continued advancement in participant competencies. Table 5 presents these quantitative assessment results.

**Table 5.** Cycle 2 Questioning Skills Assessment Results

| Meeting | Subject | Question Type | Articulation | Fluency | Total Score | Mean Score | Conversion |
|---|---|---|---|---|---|---|---|
| 1 | A | 3 | 2 | 2 | 7 | 2.34 | BSH |
| | B | 3 | 2 | 3 | 8 | 2.67 | BSH |
| 2 | A | 3 | 2 | 2 | 7 | 2.34 | BSH |
| | B | 4 | 3 | 3 | 10 | 3.34 | BSB |
| Total | | 13 | 9 | 10 | 32 | 2.67 | BSH+ |

*Note: BSB = Berkembang Sangat Baik (Developing Very Well)*

Cycle 2 results revealed significant developmental progress for both participants. Subject A achieved consistent "developing as expected" classifications, while Subject B demonstrated advancement to "developing very well" by the second session. The overall mean score of 2.67 indicated substantial improvement in questioning competencies across all measured dimensions.

Guided dialogue observations during Cycle 2 further confirmed these positive developmental trends. Table 6 summarizes the qualitative assessment data.

**Table 6.** Cycle 2 Guided Dialogue Observation Results

| Meeting | Subject | Quality | Response | Support | Total Score | Mean Score | Conversion |
|---|---|---|---|---|---|---|---|
| 1 | A | 3 | 2 | 2 | 7 | 2.34 | BSH |
| | B | 2 | 3 | 3 | 8 | 2.67 | BSH |
| 2 | A | 0 | 2 | 2 | 4 | 1.34 | MB |
| | B | 4 | 3 | 3 | 10 | 3.34 | BSB |
| Total | | 9 | 10 | 10 | 29 | 2.42 | BSH- |

During Cycle 2, participants demonstrated enhanced question quality, with inquiries becoming more contextually relevant and topically focused. Subject A produced questions such as "How do you make the slide?" while Subject B asked, "Is this slide made from paper?" These examples illustrated developing critical thinking skills and increased curiosity about construction processes and material properties.

***Cycle 3 Implementation Results***

The third intervention cycle focused on project presentation, evaluation, and reflection phases. Participants engaged in peer interviews, group presentations, and collaborative assessment activities to consolidate their questioning skill development.

Final questioning skills assessments conducted during Cycle 3 demonstrated optimal competency achievement for both participants. Table 7 presents these culminating assessment results.

The final cycle results indicated successful achievement of questioning competency development objectives. Both participants attained "developing very well" classifications by the conclusion of the intervention period. The overall mean score of 3.16 represented substantial improvement from the initial pre-cycle baseline of 1.00.

**Table 7.** Cycle 3 Questioning Skills Assessment Results

| Meeting | Subject | Question Type | Articulation | Fluency | Total Score | Mean Score | Conversion |
|---|---|---|---|---|---|---|---|
| 1 | A | 3 | 2 | 3 | 8 | 2.67 | BSH |
| | B | 4 | 3 | 3 | 10 | 3.34 | BSB |
| 2 | A | 4 | 3 | 3 | 10 | 3.34 | BSB |
| | B | 4 | 3 | 3 | 10 | 3.34 | BSB |
| Total | | 15 | 11 | 12 | 38 | 3.16 | BSB- |

Guided dialogue observations during the final cycle confirmed these quantitative findings. Table 8 summarizes these concluding qualitative assessments.

**Table 8.** Cycle 3 Guided Dialogue Observation Results

| Meeting | Subject | Quality | Response | Support | Total Score | Mean Score | Conversion |
|---|---|---|---|---|---|---|---|
| 1 | A | 4 | 2 | 3 | 9 | 3 | BSH |
| | B | 4 | 3 | 3 | 10 | 3.34 | BSB |
| 2 | A | 4 | 2 | 3 | 9 | 3 | BSH |
| | B | 4 | 3 | 4 | 11 | 3.67 | BSB |
| Total | | 16 | 10 | 13 | 39 | 3.25 | BSB- |

***Overall Developmental Progress Analysis***

The comprehensive developmental trajectory across all intervention cycles demonstrated systematic and sustained improvement in questioning competencies. Table 9 presents the comparative analysis of mean scores across all research phases.

**Table 9.** Cross-Cycle Questioning Skills Development Comparison

| Aspect | Pre-Cycle | Cycle 1 | Cycle 2 | Cycle 3 |
|---|---|---|---|---|
| Question Frequency | 1.0 | 2.5 | 3.0 | 3.0 |
| Question Type Diversity | 1.0 | 2.5 | 3.25 | 3.75 |
| Articulation Clarity | 1.5 | 1.5 | 2.25 | 2.75 |
| Question Quality | 2.0 | 2.0 | 2.25 | 4.0 |
| Fluency/Spontaneity | 1.5 | 2.0 | 2.5 | 3.0 |
| Self-Confidence | 2.0 | 3.0 | 3.0 | 3.4 |
| Response to Questions | 1.5 | 1.5 | 2.5 | 2.5 |
| Support/Assistance Required | 1.5 | 1.75 | 2.5 | 3.25 |
| Active Project Participation | 2.0 | 2.5 | 3.5 | 3.5 |
| Collaboration/Social Interaction | 1.5 | 2.25 | 2.75 | 3.25 |
| Overall Mean Score | 1.55 | 2.15 | 2.75 | 3.24 |
| Performance Classification | MB | MB+ | BSH | BSB |
| Improvement Percentage | Baseline | 38.7% | 77.4% | 109.0% |

The data revealed consistent developmental progress across all measured competency areas. The most significant improvements occurred in question type diversity (275% increase), question quality (200% increase), and support independence (216.7% increase). Overall performance advanced from "beginning to develop" to "developing very well" classifications, representing a 109% improvement over baseline measurements.

**Discussion**

The findings of this study provide substantial evidence supporting the effectiveness of project-based learning methodologies in enhancing questioning skills among preschool children with speech delays. The systematic improvement observed across all intervention cycles demonstrates the potential of structured, experiential learning approaches to address communication challenges in early childhood populations, with participants achieving a remarkable 109% improvement from baseline measurements (mean scores progressing from 1.55 to 3.24).

The consistent developmental trajectory observed throughout the three intervention cycles aligns strongly with Dewey's foundational philosophy of "learning by doing" (Hitt, 2010). The project-based

approach created authentic contexts where children encountered genuine information needs, thereby stimulating intrinsic motivation for questioning behaviors. This observation supports constructivist learning principles, where meaningful learning occurs when students actively construct knowledge through environmental interaction (Brundiers & Wiek, 2013; Krajcik & Shin, 2023). Unlike traditional teacher-centered instructional methods, the project environment provided natural opportunities for participants to develop communication competencies through hands-on exploration and collaborative problem-solving.

The research findings corroborate theoretical assertions that questioning serves as a fundamental teaching activity with crucial educational importance (Clegg, 1987; Sahin, 2013). The dramatic improvements in question type diversity (275% increase) and question quality (200% increase) demonstrate that conceptual understanding and knowledge structuring can indeed be realized through systematic questioning processes (Brualdi, 1998). The project-based methodology successfully enabled participants to move beyond surface-level inquiries toward more complex exploratory questions, supporting the notion that questions drive thought beneath superficial thinking by forcing engagement with complexities (Elder & Paul, 2003).

The current study extends existing literature by specifically addressing questioning skill development in speech-delayed populations through project-based methodologies. While previous research has demonstrated various approaches to enhancing questioning abilities in typical populations - including problem-based learning with snowball throwing methods (Hariyanti et al., 2024), talking stick learning models (Hery et al., 2023), and question student have models (Isroyati et al., 2022) - these studies predominantly focused on conventional educational approaches with typically developing students.

This research addresses a critical gap by implementing project-based learning as an inquiry-based instructional method that engages learners in knowledge construction through meaningful project completion and real-world product development (Brundiers & Wiek, 2013; Krajcik & Shin, 2023). The environmental exploration and geometric shape identification projects fulfilled key project-based learning characteristics, including driving questions, learning goal focus, educational activity participation, student collaboration, and tangible artifact creation (Krajcik & Shin, 2023). The maket construction activities distinguished this approach from other student-centered pedagogies by emphasizing authentic problem-solving and collaborative knowledge construction.

The substantial improvements in questioning competencies observed in this study support theoretical frameworks emphasizing questions' significant role in developing critical thinking skills across all educational levels (Şeker & Kömür, 2008). The progression from simple identification queries to exploratory "how" and "why" questions demonstrates that participants developed metacognitive processes resulting in more efficient learning patterns. The project-based context successfully activated questioning strategies that encouraged analysis, problem-solving, and inquiry (Godfrey, 2001), moving participants beyond basic information-seeking toward interpretative and assumption-examining questions.

Particularly noteworthy is the finding that thinking was indeed driven by question generation rather than answer provision (Elder & Paul, 2003). The project activities generated fresh questions that served as driving forces in participants' thinking processes, with each answer stimulating further inquiry. This cyclical questioning pattern supports assertions that learning occurs only when students have questions that continue thought's vitality (Elder & Paul, 2003). The geometric shape exploration project successfully created contexts where questions of purpose led students to define tasks, questions of information enabled examination of sources, and interpretation questions helped organize meaning from information (Şeker & Kömür, 2008).

The research outcomes demonstrate that project-based learning successfully functioned as a student-centered approach opposing traditional teacher-centered methods, allowing learners to acquire knowledge through project work and experience (Rhodes & Garrick, 2003). The teacher's role as facilitator rather than primary knowledge transmitter proved particularly effective for children with

speech delays, who benefited from reduced performance pressure and increased collaborative support. This finding aligns with theoretical descriptions of effective project-based learning where teachers frame worthwhile questions, structure meaningful tasks, and coach both knowledge development and social skills (David, 2008).

The environmental exploration projects successfully utilized multifaceted projects as central organizing strategies for educating students (Ngoh, 2015) while emphasizing knowledge construction through problem-solving methodologies (Laffey et al., 1998). The improvement in support independence (216.7% increase) demonstrates that participants developed self-directed learning capabilities, moving from external dependence toward autonomous question formulation and exploration.

Consistent with existing literature, this study confirmed that project-based learning induced higher intrinsic motivation, critical thinking skills, and peer learning appreciation (Holmes & Hwang, 2016). The observed increases in collaborative social interaction (from 1.5 to 3.25 mean scores) and active project participation demonstrate that project-based methodologies enhanced engagement by stimulating curiosity and discovery (Chu et al., 2012). The maket construction activities provided authentic contexts for communication skill development, supporting assertions that project-based learning exposes students to real-world problems while boosting communication skills through applied learning (Toledano-O'Farrill, 2019; Pan et al., 2019).

The successful application of project-based learning for children with speech delays contributes significant insights to inclusive early childhood education practices. The research demonstrates that strength-based interventions can effectively address communication challenges without deficit-focused approaches. The naturalistic project environment allowed participants to develop questioning competencies alongside typically developing peers, supporting inclusive educational principles while accommodating diverse learning needs.

The study's implications extend beyond immediate educational applications, as enhanced questioning skills facilitate improved cognitive development, increased social interaction capabilities, and stronger foundations for future academic success. By demonstrating project-based learning's potential in addressing communication challenges, this research contributes to developing more inclusive and effective early childhood education practices that serve all learners, particularly those with special educational needs.

Several limitations warrant consideration in interpreting these findings. The small sample size (n=2) restricts generalizability to broader populations, while the specific cultural and linguistic context may influence applicability across different educational settings. The study focused exclusively on questioning competencies, representing only one dimension of communication development. Additionally, the research was conducted within a single classroom environment, which may limit external validity.

Future research should examine project-based learning effectiveness across larger, more diverse samples of children with speech delays, investigate long-term maintenance of communication improvements, and explore applications to other communication domains such as narrative skills and pragmatic language use. Comparative studies examining optimal intervention duration and intensity would inform practical implementation guidelines for inclusive educational practice. Furthermore, research investigating the generalization of questioning skills across different contexts and subject areas would strengthen understanding of project-based learning's broader educational impact.

## CONCLUSION

This action research demonstrated that project-based learning methodology significantly enhanced questioning skills among preschool children with speech delays, with participants achieving a 109% improvement from baseline to final assessment (mean scores progressing from 1.55 to 3.24). The intervention successfully addressed multiple competency dimensions including question type

diversity, articulation clarity, response fluency, and collaborative engagement through systematic implementation of environmental exploration projects across three instructional cycles.

The study contributes to inclusive early childhood education by providing empirical evidence that children with speech delays can achieve substantial communication improvements through experiential learning approaches rather than traditional deficit-focused interventions. This research extends existing literature by specifically examining questioning skill development in speech-delayed populations through project-based methodologies, offering a comprehensive developmental trajectory analysis that documents both quantitative and qualitative improvements across multiple assessment dimensions.

The findings have important implications for educational practice, suggesting that authentic learning contexts naturally motivate communication behaviors while simultaneously addressing curricular objectives. Early childhood educators can implement project-based approaches to create inclusive environments that support diverse learners through collaborative, hands-on experiences that capitalize on children's intrinsic curiosity and social learning capabilities.

However, several limitations warrant consideration. The small sample size (n=2) restricts generalizability to broader populations, while the specific cultural and linguistic context may influence applicability across different educational settings. The study focused exclusively on questioning competencies, representing only one dimension of communication development.

Future research should examine project-based learning effectiveness across larger, more diverse samples of children with speech delays, investigate long-term maintenance of communication improvements, and explore applications to other communication domains such as narrative skills and pragmatic language use. Additionally, comparative studies examining optimal intervention duration and intensity would inform practical implementation guidelines for inclusive educational practice.

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