

DEVELOPING COMMUNICATION SKILLS FOR 5-6-YEAR-OLD CHILDREN WITH AUTISM SPECTRUM DISORDER THROUGH PROJECT-BASED LEARNING: A CASE STUDY

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Abstract. Developing communication skills for children aged 5–6 with autism spectrum disorder plays a crucial role in enhancing their social interaction, increasing their ability to integrate, and fostering essential life skills. This study was conducted to evaluate the effectiveness of Project-Based Learning (PBL) in improving communication skills for children with ASD in an inclusive early education setting. The research adopts a single-group pretest-posttest experimental design and implements a 4-month project-based intervention with two children at a specialized education center. Data were collected using a combination of qualitative and quantitative methods for assessing communication skills. After four months of experimentation, children's overall communication scores increased from 1.46 to 2.64, indicating meaningful gains in verbal expression, comprehension, turn-taking, and attention regulation. The findings suggest that PBL is effective when sustained and personalized to children's needs. The study concludes that PBL holds strong potential as a viable intervention model for children with ASD, especially when integrated into long-term, structured learning environments. It recommends broader application of PBL in special education and emphasizes the importance of teacher training and parental involvement in supporting communication development.

Keywords: Communication skills, autism spectrum disorder (ASD), project-based learning, early intervention.

1. Introduction

Autism Spectrum Disorder (ASD) is a rapidly increasing neurodevelopmental condition worldwide, including in Vietnam. The current prevalence of ASD in children is approximately 2.27% according to the U.S. Centers for Disease Control and Prevention, while in Vietnam, statistics from the Ministry of Labor, Invalids, and Social Affairs estimate this rate to be between 1% and 1.5% [1]. This rising trend poses significant challenges for the education system and highlights an urgent need for effective intervention strategies, particularly in communication skill development - one of the core deficits in children with ASD [2].

Children with ASD often struggle to initiate, maintain, and conclude conversations, interpret non-verbal cues such as eye contact, gestures, and facial expressions, and use language appropriately in different social contexts. These limitations not only impact their academic performance but also hinder the development of social relationships, leading to isolation and difficulty integrating into society [3].

Previous studies, both internationally and in Vietnam, have shown that PBL can be effectively adapted in special education contexts, including for children with ASD, to foster communication skills, social interaction, and self-regulation. For example, project-based inquiry has been emphasized as a means to increase active participation in young learners [4], while structured project activities have been found to improve peer engagement in children with autism [5].

Given this context, identifying appropriate educational methods to foster communication skills in young children with ASD is imperative. Among current approaches, PBL is viewed as an effective and humanistic strategy. It creates an active learning environment that promotes autonomy, critical thinking, and collaboration, offering children opportunities to practice communication in real-life scenarios [6], [7], [8].

Recent studies also confirm that PBL supports children with ASD in improving social interaction, responsiveness, and expressive abilities through group work, individual projects, and role-playing activities [9], [10]. Furthermore, the integration of multisensory strategies [11] and Universal Design for Learning (UDL) principles [12] within the PBL framework can enhance its effectiveness in communication training for children with ASD.

However, in Vietnam, there remains a lack of research focused on applying PBL to develop communication skills in older preschoolers with ASD. Therefore, the present study, “developing communication skills for children aged 5–6 with autism spectrum disorder through project-based learning” was conducted to assess the practical effectiveness of this approach and propose appropriate applications within special education settings, particularly at educational support centers for children with disabilities.

2. Content

2.1. Theoretical Basis and Framework

2.1.1. Developing communication skills for children aged 5–6 years with autism spectrum disorder

Communication is the process of exchanging information, needs, and emotions between at least two parties using various forms of language. It is inherently a two-way process, where the roles of sender and recipient alternate among participants. This reciprocity is a prerequisite for effective communication. Communication includes two main forms: verbal (spoken and written language) and non-verbal (such as facial expressions, eye contact, tone of voice, gestures, and symbols) [13]. During early childhood, communication skills play a critical role in personality formation, social adaptation, and cognitive development.

Communication skills refer to an individual’s capacity to use verbal and non-verbal means effectively. This includes a system of gestures, postures, behaviors, and speech to create harmonious interactions [14]. For children with ASD, enhancing communication skills not only improves their ability to express needs but also supports personal development, life skills, and social integration [5]. These children often struggle with initiating, sustaining, and ending conversations, understanding non-verbal signals, and using appropriate language. Thus, establishing appropriate intervention strategies is essential.

According to MT Phuong et al., while preschool education programs for children with ASD remain inconsistent, areas such as school readiness, cognitive skills, and learning strategies are emphasized, using methods like hands-on practice, visual supports, positive reinforcement, and

modeling [3]. Furthermore, multisensory methods have shown high effectiveness in promoting communication and social interaction. Ha TNQ emphasized that stimulating multiple senses simultaneously (vision, hearing, touch, etc.) significantly enhances responsiveness, social behavior adjustment, and individualized learning outcomes [11].

To design effective support strategies, it is essential to assess the current level of a child's communication skills, identify their strengths and limitations, and propose appropriate interventions. Communication ability in children with ASD can be categorized into three levels [15]:

- *Level 1 (1 point)*: The child cannot perform communication skills, even with assistance.
- *Level 2 (2 points)*: The child performs the skills with direct support.
- *Level 3 (3 points)*: The child performs the skills independently and can engage in group activities.

The goal of communication education is to help children understand and use communicative behaviors to manage everyday situations. These include attention, imitation, turn-taking, comprehension, and appropriate responses through verbal, gestural, and behavioral means [5]. Based on studies by Nguyen TT [5] and Rogers [16], this study focuses on four key communication skills for children aged 5–6 with ASD:

- *Attention regulation*: Directing interest toward a story, understanding simple questions (e.g., “What?”, “Who?”).
- *Turn-taking*: Taking turns in games, maintaining short conversations (2–3 exchanges).
- *Language comprehension*: Following verbal instructions, distinguishing object characteristics.
- *Verbal expression*: Answering complex questions (“Why?”, “How?”), using 3–4 word sentences to describe situations.

2.1.2. Project-based learning in developing communication skills for children aged 5–6 years with ASD

Project-Based Learning is an educational approach that enables children to engage actively in learning through inquiry and exploration of meaningful topics. A project can be carried out individually, in small groups, or as a class, both at school and at home. It transforms the classroom into a dynamic environment where children pursue answers to their own questions [4].

PBL empowers children to pose questions, investigate, and choose implementation methods, thereby fostering motivation, creative thinking, and communication competence [8]. Globally applied from preschool to higher education, PBL is adaptable for different learner groups [17]. As a learner-centered model, it enables children to control the learning process - from setting goals to selecting content, implementation, and self-evaluation.

For children with ASD, PBL offers several advantages:

- *Personal development and social inclusion*: Children independently approach problems, use appropriate resources, and present findings, building ownership and responsibility. PBL fosters greater inclusion in general education and social interaction [18].
- *Active participation and creativity*: With teacher guidance, children demonstrate higher autonomy and decision-making in exploration [4].
- *Improved communication and collaboration*: Group projects provide real interaction opportunities, enhancing verbal expression, listening, and teamwork.
- *Interdisciplinary learning*: Children apply knowledge from multiple subjects to explore real-world issues, encouraging structured thinking and analysis.
- *Family and community engagement*: PBL highlights the role of collaboration among educators, families, and communities, ensuring that children receive holistic support.

Key principles to strengthen communication through PBL include encouraging participation, peer-assisted learning, and integrating UDL to optimize inclusion and pragmatic language development [12].

In this study, the “Exploring the Rainbow” project was implemented to develop communication skills in children with ASD, following the three stages of PBL outlined by Helm and Katz [4]. The “Exploring the Rainbow” project was selected because of its relevance to children’s daily experiences, opportunities for multisensory engagement, and flexibility to integrate art, science, and language activities. Unlike traditional individualized or small-group interventions, this project emphasized collaborative discovery and presentation, thereby offering richer contexts for practicing functional communication.

- *Phase 1 – Project initiation*: Teachers initiated discussions to stimulate interest and identify the topic. Upon proposing “Exploring the Rainbow,” the children actively engaged. Teachers guided them to formulate questions, gather materials, and plan activities.

- *Phase 2 – Project development*: Content was adapted to the learning needs of 5–6-year-olds with ASD. Children participated in field trips, discussions, experiments, drawing, poetry, dramatization, and games to reinforce learning through real experiences.

- *Phase 3 – Project conclusion*: Teachers interviewed children and parents, organized an exhibition for students to present their findings, and evaluated outcomes to inform future project planning.

Selecting familiar, engaging topics stimulates the natural communicative needs of children with ASD, especially in real-life learning contexts, while a well-structured PBL model not only improves communication but also fosters independent thinking and social integration [5].

2.2. Research methodology

This study adopts a qualitative case study design integrated with quantitative evaluation to investigate the effectiveness of PBL in developing communication skills for children aged 5–6 with ASD. The research was conducted at the Educational Support Center, located in Thu Duc City, Ho Chi Minh City.

2.2.1. Participants

Two children were selected through purposive sampling: Child 1 (C1), a boy aged 6 years 1 month, and Child 2 (C2), a girl aged 6 years 6 months. Both had been diagnosed with Level 1 ASD based on DSM-5 criteria by a qualified medical specialist, indicating mild symptoms that require minimal support. Prior to the study, the participants were enrolled in regular intervention programs at the Educational Support Center in Thu Duc City. Detailed information about the children was kept confidential in accordance with research ethics.

2.2.2. Instruments

Data were collected using observational checklists, semi-structured interviews with teachers, and a communication skill rating scale based on the framework developed by Nguyen TT (2013), which evaluates three levels of communication performance: 1 = inability, 2 = supported performance, and 3 = independent performance [15].

2.2.3. Procedure

Each week, the children participated in three sessions (two group-based and one individual), each lasting approximately 60 minutes. Group sizes consisted of 3–4 children, including both peers with ASD and typically developing peers to promote inclusion. Communication skills were rated at the end of each session using the Nguyen TT (2013) scale, by two trained raters (classroom teacher and special educator) to ensure inter-rater reliability [15].

The intervention spanned four months, structured around a project titled “Exploring the Rainbow.” The project followed three phases: initiation, development, and conclusion [4]. During

the intervention, children engaged in real-life communication experiences through group-based and hands-on activities.

- *Purpose of the intervention:* To examine the feasibility and effectiveness of strategies for developing communication skills through PBL in children aged 5–6 years with ASD.
- *Content of the intervention:* The experimental activities were conducted through the “Exploring the Rainbow” project, involving both group and individual activities based on the PBL process. The communication skills addressed were categorized into attention regulation, turn-taking, language comprehension, and verbal expression [5].
- *Duration and location:* From September 30, 2024 to February 21, 2025.
- *Intervention process:* The procedure comprised three main steps:
 - + *Pre-intervention assessment:* Evaluating the children’s initial communication skill levels.
 - + *Formative intervention:* Implementing the project activities using the proposed strategies.
 - + *Post-intervention assessment:* Measuring the children’s progress using a three-level communication skills scale developed by Nguyen TT [15], which was introduced in section 2.1.1.

2.2.4. Data Analysis

The qualitative data were compiled and coded as Teacher 1 and Teacher 2. Descriptive statistics were employed to calculate the mean scores (M) and standard deviations (SD) of the participants’ communication skills. Inferential statistics were applied by comparing the mean scores of the pre-test (pre) and post-test (post). Statistical significance was assessed using the independent samples t-test, which is considered appropriate for small sample sizes [19].

2.3. Findings & discussion

2.3.1. Levels of children’s communication skills

The observation checklists were given to teachers to evaluate the communication skills of two children during a “storytelling” session. The evaluation was carried out once, on the same day, with input from both the teachers and the research team. Scores for each skill ranged from 1 (minimum) to 3 (maximum), and the findings were compiled and displayed in Table 1.

Table 1. Levels of communication skills in children aged 5–6 with autism spectrum disorder

Communication skills	C1	C2
<i>1. Attention regulation</i>		
Demonstrates interest in short stories and understands parts of the story in response to simple questions (e.g., “What?” and “Who?”).	2	1
Initiates and maintains a conversation with a self-generated topic with an adult.	2	1
<i>2. Turn-taking</i>		
Understands the concept of taking turns during independent play.	1	1
Engages in adult-initiated conversations for 2–3 turns, covering various communicative functions (e.g., commenting, responding, and requesting information).	2	1
<i>3. Language comprehension</i>		
Answers questions related to the features of objects or pictures and identifies object characteristics.	2	1
Understands the concepts of “same” and “different.”	1	1
Selects objects based on 2–3 combined attributes (e.g., size, quantity, color, label).	1	1
<i>4. Verbal expression</i>		

Responds to complex questions (e.g., “Why?”, “How?”).	1	1
Produces consistent 3–4-word sentences.	3	3
Describes current experiences using 3–4 word sentences.	2	1
Uses progressive verb forms (e.g., “đang”) to describe ongoing actions.	1	1
Mean	1.80	1.50
(SD)	(.60)	(.81)

According to Table 1, both children have not yet developed the ability to interact independently and proactively. They are only able to produce short utterances consisting of 3–4 words with consistency (Level 3).

For Child 1, the child was able to focus attention, observe, and participate in conversations when initiated by adults; however, support from teachers and peers was still required to answer questions about character traits in stories and to describe personal experiences (Level 2). This was also confirmed by the teacher: *“The child can concentrate and participate in conversations when prompted by adults, speaks fluently, and uses grammatically correct sentences”* (Teacher 2). Nonetheless, the child was not yet able to perform several communication tasks even with support, including taking turns during independent play, distinguishing similarities and differences, retrieving objects based on 2–3 different cues, using language to answer complex questions, and describing ongoing activities (Level 1). The child tended to play alone, showed limited interaction with peers, and required teacher reminders to engage in group activities. As observed and reported by the teacher: *“The child was highly interested in ships, airplanes, or sucking fingers, preferred dry foods like bread, and needed to be informed in advance before going to unfamiliar places. Some basic communication skills such as turn-taking during play, distinguishing features, or answering inferential questions still required significant support and remained at Level 1–2”* (Teacher 1).

For Child 2, most communication skills were at Level 1, indicating that the child was unable to perform these skills even with support from teachers and surrounding adults. The teacher noted: *“Child 2 tended to become easily frustrated when things did not go as expected and struggled to express emotions. The child enjoyed drawing, often chose the color pink, and frequently repeated images such as the sun, flowers, houses, and girls. Most of the child’s communication skills remained at Level 1, even with support”* (Teacher 1, Teacher 2).

2.3.2. Experimental results on communication skill development for children aged 5 to 6 years with autism spectrum disorder

The “Exploring the Rainbow” project was implemented with the aim of developing communication skills in children aged 5 to 6 years with ASD. The project was conducted over a four-month period and included six hours of group activities and sixteen hours of individual training for each child. During the intervention, communication skills were assessed twice at two-month intervals. The results of the two assessments are presented in Table 2.

Table 2. Experimental results for two children at the 2-month and 4-month stages

Communication skills	Two-month experiment		Four-month experiment	
	C1	C2	C1	C2
<i>1. Attention regulation</i>				
Demonstrates interest in short stories and understands parts of the story in response to simple questions (e.g., “What?” and “Who?”).	3	1	3	3

Initiates and maintains a conversation with a self-generated topic with an adult.	2	1	3	2
<i>2. Turn-taking</i>				
Understands the concept of taking turns during independent play.	1	2	2	3
Engages in adult-initiated conversations for 2–3 turns, covering various communicative functions (e.g., commenting, responding, and requesting information).	2	1	3	2
<i>3. Language comprehension</i>				
Answers questions related to the features of objects or pictures and identifies object characteristics.	2	1	3	3
Understands the concepts of “same” and “different.”	2	1	3	3
Selects objects based on 2–3 combined attributes (e.g., size, quantity, color, label).	2	2	2	2
<i>4. Verbal expression</i>				
Responds to complex questions (e.g., “Why?”, “How?”).	2	1	2	2
Produces consistently 3–4-word sentences.	3	3	3	3
Describes current experiences using 3–4-word sentences.	3	2	3	3
Uses progressive verb forms (e.g., “đang”) to describe ongoing actions.	2	1	3	2

According to Table 2, the qualitative assessment results after two months of intervention indicate that most communication skills in both children reached Level 2, meaning the children were able to perform the skills with direct support from adults [15]. Specifically, Child 1 showed a notable improvement in attention skills (reaching Level 3) and began to describe personal experiences using 3–4-word sentences. Other skills, such as answering questions about object characteristics, understanding similarities and differences, maintaining conversation, and using sentences to describe actions, improved from Level 1 to Level 2. Child 2 made progress in turn-taking during independent play, retrieving objects based on cues, and describing with short sentences, indicating a gradual ability to engage in structured interactions. However, some skills remained at Level 1, particularly turn-taking for Child 1 and attention skills for Child 2, highlighting individual differences in response to intervention [5].

Table 3. Results of the t-test on children’s communication skill levels at the two- and four-month experiment

Communication skills	Two-month experiment				Four-month experiment			
	Child 1 (C1)		Child 2 (C2)		Child 1 (C1)		Child 2 (C2)	
	<i>pre</i>	<i>post</i>	<i>pre</i>	<i>post</i>	<i>pre</i>	<i>post</i>	<i>pre</i>	<i>post</i>
Attention regulation	2	2.5	1	1	2	3	1	2.5
Turn-taking	1.5	1.5	1	1.5	1.5	2.5	1	2.5
Language comprehension	1.3	2	1	1.3	1.3	2.67	1	2.67
Verbal expression	1.75	2.25	1.5	1.75	1.75	2.75	1.5	2.5
Mean (SD)	1.64 (.26)	2.06 (.37)	1.13 (.21)	1.39 (.27)	1.64 (.26)	2.73 (.18)	1.13 (.20)	2.54 (.07)
<i>t-test</i>	t(6)=1.622 (p>.05)		t(6)=1.300 (p>.05)		t(6)=5.935 (p<.01)		t(6)=10.736 (p<.001)	

According to Table 3, the quantitative analysis using the t-test after two months of intervention shows no statistically significant difference between the pre- and post-intervention scores (Sig. = 0.01). This indicates that while initial improvements had begun to emerge in certain skills, they were not yet strong or consistent enough to yield statistically significant changes. For example, receptive and expressive language skills in both children increased only slightly: Child 1's receptive language score improved from 1.3 to 2, and Child 2's from 1 to 1.3. Expressive language scores increased from 1.75 to 2.25 for Child 1 and from 1.5 to 1.75 for Child 2. These results reflect limited progress during the early phase and underscore the need for sustained, long-term intervention.

After extending the program by an additional two months (a total of four months), the second assessment revealed a statistically significant difference (Sig. = 0.01), with all communication skill scores reaching between 2.5 and 3 points—indicating that the children were able to perform the skills independently or with minimal support. The overall average score increased from 1.46 to 2.64, affirming that the PBL method produced clear improvements when implemented over an appropriate duration.

This conclusion advocates the importance of flexible play-based learning environments [15], as well as the effectiveness of the UDL framework in personalizing learning activities [12]. Research on PECS [2] and on parent-guided interactive storytelling [20] also emphasizes the critical role of intervention duration and frequency in the development of communication skills. These findings support the assertion that project-based learning is a promising model for intervention in children with ASD, particularly when applied consistently, purposefully, and in alignment with each child's individual context.

These results align with prior research, which demonstrates that cooperative learning contexts promote both social and linguistic gains for students with autism [19], and show significant improvements in expressive abilities through PBL-based loose parts activities in early childhood settings [9].

Based on the research findings, several important management implications can be drawn. First and foremost, it is essential to develop training programs for preschool and special education teachers that equip them with the knowledge and skills to implement PBL tailored to the specific needs of children with ASD. In addition, close collaboration between schools and families should be strengthened to ensure continuity and consistency throughout the intervention process. Special education institutions are also encouraged to proactively adopt PBL as a tool for personalizing communication skill development, while establishing integrated assessment systems that combine both qualitative and quantitative methods to closely monitor each child's developmental progress.

However, this study has several limitations. First, the small sample size (limited to only two children) does not adequately represent the diversity of children with ASD. Second, the intervention period lasted only four months, which is insufficient to capture long-term and stable changes. Furthermore, the study did not include a comparative analysis between PBL and other intervention models, which would have helped evaluate its relative effectiveness.

Future research should therefore be expanded. Specifically, studies with larger and more diverse samples—varying in age, severity of disorder, and educational context—should be conducted. In addition, controlled studies comparing the effectiveness of PBL with other intervention approaches such as PECS or ABA would be valuable. Extending the intervention duration to 6 months or even one year is also recommended to evaluate the stability and sustainability of outcomes. Finally, future research should further clarify the role of parents in supporting project-based learning activities at home.

3. Conclusions

This study demonstrates that, when implemented systematically and sustained over an adequate period of time, project-based learning can produce significant improvements in the development of communication skills among children aged 5–6 years with Autism Spectrum Disorder. The results indicate notable progress in verbal expression, language comprehension, conversational maintenance, and participation in group activities. Although no statistically significant differences were observed during the initial two-month phase, by the end of the four-month intervention, the children achieved levels of communication that were either independent or required only minimal support. These findings not only confirm the feasibility and effectiveness of the PBL approach in special education settings but also provide a foundation for its broader application in future individualized intervention programs for children with ASD.

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