IHYA ULUM
Early Childhood Education Journal
Fakultas Keguruan dan Ilmu Pendidikan Universitas Islam Makassar
E-ISSN 2962-8504

The Effect of Magnetic Letter-Based Play Activities on Early Literacy Skills of Children Aged 5-6 Years

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Abstract

Early literacy skills are a critical foundation for children's readiness to enter formal education. However, data show that Indonesia ranks 67th out of 81 countries in PISA 2022, indicating that literacy competency requires strengthening from the earliest stages of education. Initial observations revealed that of the 39 children in Group B, 5 had not recognized any letters at all, while 15 only recognized some letters; from this population, a purposive sample of 20 children exhibiting sub-optimal early literacy was selected and divided into an experimental group (n=10) and control group (n=10). This study aims to investigate (1) the description of magnetic letter media use, (2) children's early literacy ability before and after treatment, and (3) the effect of play activities using magnetic letter media on early literacy skills. A quasi-experimental approach with a Non-Equivalent Control Group Design was employed. Data were collected through observation, tests, and documentation, then analyzed using descriptive statistics and the Wilcoxon Signed Rank Test. Result showed that the experimental group's mean score increased from 28.4 (pre-test) to 38.3 (post-test), a gain of 9,9 points, while the control group only increased by 2.6 points. The Wilcoxon test yielded a significance value of 0.005 ($p < 0.05$), confirming that play activities using magnetic letter media significantly enhance early literacy skills in children aged 5-6 years at Makassar of Islam Al-Abrar Kindergarten.

Keywords: early literacy; magnetic letter media; play activity; early childhood education; quasi-experiment.

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Fajriati, Z., Rusmayadi, R., Dzulfadhilah, F. (2026). The Effect of Magnetic Letter-Based Play Activities on Early Literacy Skills of Children Aged 5-6 Years. *Ihya Ulum: Early Childhood Education Journal. Vol. 4*(2), 964-974. https://doi.org/10.59638/ihyaulum.v4i2.926

Received April 29, 2026; Revised May 27, 2026; Accepted June 28, 2026; Available online July 30, 2026.

INTRODUCTION

Education is a fundamental need for every individual, as it enables the development of one's potential on both family and school environments. One of the most critical stages of education is Early Childhood Education (ECE). According to the Regulation of the Minister of Basic and Secondary Education of the Republic of Indonesia Number 12 of 2025, Article 1 Paragraph 4, ECE is defined as a developmental effort directed at children from birth to the age of six years through the provision of educational stimulation to support physical and spiritual growth and development, ensuring children's readiness for subsequent levels of education (Permendikdasmen, 2025).

The National Association for the education of Young Children (NAEYC) defines early childhood as the period spanning from birth to 8 years of age (Munafiah & Lukman, 2023).One of the most important developmental aspects to cultivate from an early age is language ability, particularly early literacy (Mahfira et al., 2023). Early literacy encompasses not merely reading ability, but also letter recognition, phonological awareness, and beginning reading skills-all of which form the foundation for children's readiness in formal schooling (Muzakki et al., 2022).

Theoretically, early literacy development is closely linked to children's cognitive development. According to Piaget's cognitive development theory, children aged 5-6 years are in the preoperational stage, during which they begin using symbols to represent object and sounds (Piaget, 1960; Purnamasari, 2024). At this stage, children still require concrete experiences to understand abstract concepts such as letter symbols.

This perspective reinforces the importance of multisensory approaches in letter learning, involving concrete experiences such as touching, arranging, attaching, or manipulating letters (Clay, 200; Doyle, 2023) Previous research supports the use of concrete and visual media, particularly magnetic letter media, in improving letter recognition and beginning reading skills. Isnaini and Sukmawati (2023) demonstrated that magnetic board use helped children recognize letters more concretely through attaching and arranging activities. Ramadani and Irdanumrni (2023)found that pictorial magnetic letter media was effective in helping children, particularly those with hearing impairments, recognize letters through interactive and enjoyable activities. Furthermore, Setiawati et al. (2025) reported that magnetic alphabet media improved children's attention, engagement, and letter recognition through structured, visually-based play activities.

Despite this importance, Indonesia's literacy levels remain a critical concern. PISA 2022 data showed Indonesia ranked 67th out of 81 countries, indicating that literacy competency among students remains below the OECD average (Kurniawan, 2024).Initial observations at Makassar of Islam Al-Abrar Kindergarten, conducted over five days across two separate sessions, revealed that of 39 children aged 5-6 years, 5 had not recognized any letters, and 15 only recognized partial letters. Children

also struggled to differentiate visually similar letters (e.g., b vs. d, p vs. q) and failed to connect letters with their initial sounds, thereby affecting their ability to combine letter sounds into simple words. Following these initial observations, the period leading up to the administration of the pre-test in April 2026 was occupied by instrument development and expert validation of the 12-item assessment rubric, which was declared valid on April 9, 2026 after three rounds of revision, as well as securing administrative research permits from the school.

Children who do not master early literacy skills such as letter recognition, phonological awareness, and beginning reading are at risk of experiencing learning difficulties in primary school (Robertus et al., 2024).Therefore, play activities using magnetic letter media are proposed as an appropriate intervention. Magnetic letter media provides concrete, visual, and kinaesthetic learning experiences through activities of arranging, attaching, and manipulating
letters, making literacy learning more engaging, meaningful, and effective (Yunita et al., 2026).

Beyond its pedagogical dimension, the urgency of cultivating early literacy also rests on a strong theological and philosophical foundation within Islamic education, a perspective that is especially relevant given that this study was conducted at Makassar of Islam Al-Abrar Kindergarten, an early childhood institution rooted in Islamic values. The very first revelation received by the Prophet Muhammad (peace be upon him), Surah Al-'Alaq verses 1-5, opens with the command Iqra' ("Read"): "Read in the name of your Lord who created, created man from a clinging clot. Read, and your Lord is the Most Generous, who taught by the pen, taught man that which he knew not" (QS. Al-'Alaq: 1-5). This revelation frames reading and literacy not merely as a cognitive skill but as an act of worship and the foundation of a Muslim's intellectual and spiritual formation. Islamic educational philosophy therefore positions the cultivation of early literacy in young children as part of preparing a generation able to engage with revealed knowledge alongside empirical and scientific understanding, reflecting the integration of science and Islamic values that should characterize education in an Islamic early childhood setting such as Makassar of Islam Al-Abrar Kindergarten. Introducing letter recognition and reading readiness from an early age can thus be understood as laying the intellectual capital through which children will later engage with the Qur'an and other sources of Islamic knowledge, reinforcing the importance of literacy interventions such as the one investigated in this study. This study differs from prior research in its focus on three specific early literacy indicators - letter symbol recognition, connecting letters with initial sounds, and combining letter sounds into simple words – and its implementation in a Makassar of Islam Al-Abrar Kindergarten context that emphasizes learning through play. The findings are expected to contribute to the development of innovative and developmentally appropriate literacy learning strategies in early childhood education settings.

METHOD

This study employed a quantitative research approach with a quasi-experimental design, specifically the Non-Equivalent Control Group Design (Abraham and Supriyati, 2022).Two existing classroom groups at Makassar of Islam Al-Abrar Kindergarten served as the experimental group (Class Madinah) and the control group (Class Mina), without random assignment. The experimental group received treatment using magnetic letter media, while the control group used wooden letter media as conventional learning media.

The population consisted of all 39 children aged 5-6 years in Group B at Makassar of Islam Al-Abrar Kindergarten. A purposive sampling technique was applied, yielding a sample of 20 children (10 experimental, 10 control) selected based on criteria including age (5-6 years), enrollment in Group B, and sub-optimal early literacy development based on initial observations. Data collection employed three techniques: (1) observation of children's learning process and activity engagement during treatment; (2) individual tests using letter cards (pre-test and post-test) measuring three indicators-letter symbol recognition, connecting letters with initial sounds, and combining letter sounds into simple words; and (3) documentation through photographs of learning activities.

The research was conducted over approximately one month, comprising one pre-test session (April 20, 2026), six treatment sessions (April 22 – April 30, 2026), and one post-test session (May 4, 2026). An assessment rubric with four rating categories was applied: Poor (K=1), Fair (C=2), Good (B=3), and Very Good (SB=4), across 12 item indicators with a total maximum score 48.

Construct validity was verified through expert review by two validators, with the instrument declared valid on April 9, 2026 after three rounds of revision. Data analysis involved (1) descriptive statistic (mean, median, standard deviation, minimum, and maximum) using SPSS version 25, and (2) the Wilcoxon Signed Rank Test to examine pre-test to post-test differences within each group, with a significance threshold of $p < 0,05$.

This study was conducted in accordance with standart ethical procedures for research involving young children. Written informed consent was obtained from the parents or guardians of all participating children prior to data collection, and formal research permission was secured from the principal of Makassar of Islam Al-Abrar Kindergarten. Children's participation was maintained throughout the study by using coded identifiers rather than chidren's names in the dataset.

RESULTS

Description of Magnetic Letter Media Use

The implementation of magnetic letter media comprised three phases: planning, implementation, and evaluation. During the planning phase, the researcher developed a 12-item assessment instrument across three

indicators, conducted expert validation, secured administrative permits, and prepared learning scenarios and research schedules.

The implementation phase spanned six treatment sessions focused progressively on each indicator. Sessions 1-2 targeted letter symbol recognition: children were introduced to magnetic letters one by one, practiced identifying requested letters, and differentiated visually similar letter pairs (e.g., b-d, p-q) using the magnetic board. Sessions 3-4 focused on connecting letters with initial sounds: children identified the initial sound of pictured objects, chose corresponding magnetic letters, and attached them to the board. Sessions 5-6 addressed combining letter sounds into simple words: children arranged magnetic letters to form simple words (e.g., f, balon, kipas) and practised reading them with guidance.

Throughout all sessions, children in the experimental group demonstrated higher enthusiasm and active participation compared to the control group. The concrete, manipulative nature of magnetic letter media allowed children to engage multiple senses simultaneously – seeing, touching, and moving letters –making learning more meaningful and enjoyable.

Children's Early Literacy Skills Before and After Treatment

Descriptive statistical analysis was conducted to describe early ability across both groups before and after treatment. Table 1 and Table 2 present the pre-test frequency distributions for the experimental and control groups respectively.

Table 1. Pre-Test Results: Early Literacy Skills – Experimental Group

No	*Score Interval*	*Category*	*Frequency*	*Percentage*
1	12-20	Poor (P)	1	10%
2	21-29	Fair (F)	3	30%
3	30-38	Good (G)	6	60%
4	39-48	Very Good (VG)	0	0%
		Total	10	100%

Pre-test results for the experimental group indicate that 60% of children (n=6) were categorized as Good (G, score 30-38), 30% (n=3) as Fair (F, score 21-29), and 10% (n=1) as Poor (P, score 12-20). No child achieved the Very Good category, indicating that early literacy skills had not yet developed optimally prior to intervention.

Table 2. Pre-Test Results: Early Literacy Skills - Control Group

No	*Score Interval*	*Category*	*Frequency*	*Percentage*
1	12-20	Poor (P)	1	10%
2	21-29	Fair (F)	5	50%
3	30-38	Good (G)	4	40%
4	39-48	Very Good (VG)	0	0%
		Total	10	100%

The control group's pre-test results show that 40% of children (n=4) were categorized as Good (G), 50% (n=5) as Fair (F), and 10% (n=1) as Poor (P). Both groups thus had comparable starting conditions with no children in the Very Good category.

Following treatment, post-test results demonstrated a markedly different distribution in the experimental group. Table 3 presents post-test results for the experimental group.

Table 3. Post-Test Results: Early Literacy Skills- Experimental Group

No	*Score Interval*	*Category*	*Frequency*	*Percentage*
1	12-20	Poor (P)	1	10%
2	21-29	Fair (F)	1	10%
3	30-38	Good (G)	2	20%
4	39-48	Very Good (VG)	6	60%
		Total	10	100%

Post-test results for the experimental group show a substantial shift: 60% of children (n=6) achieved the Very Good (VG) category, compared to 0% at pre-test. Only 10% remained in the Poor and Fair categories respectively. This dramatic improvement indicates the positive impact of magnetic letter media-based play activities on early literacy development.

Table 4. Post-Test Results: Early Literacy Skills – Control Group

No	*Score Interval*	*Category*	*Frequency*	*Percentage*
1	12-20	Poor (P)	1	10%
2	21-29	Fair (F)	3	30%
3	30-38	Good (G)	5	50%
4	39-48	Very Good (VG)	1	10%
		Total	10	100%

The control group's post-test results indicate more modest improvement: 50% (n=5) reached the Good category, 30% (n=3) remained Fair, and 10% (n=1) each in the Poor and Very Good categories. Table 5 provides a comparative descriptive statistics summary.

Table 5. Descriptive Statistics: Pre-Test and Post-Test Results by Group

Group	*N*	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
Pre-Test Experimental	10	13	36	28.4	6.915
Post-Test Experimental	10	17	46	38.3	9.684
Pre-Test Control	10	13	36	27.4	6.883
Post-Test Control	10	13	41	30.0	7.916

Table 5 demonstrates that the experimental group's mean score increased from 28.4 to 38.3 (a gain of 9.9 points), while the control group's mean increased only from 27.4 to 30.0 (a gain of 2.6 points). This 3.8-fold difference in improvement clearly indicates the superior effectiveness of magnetic letter media-based play activities.

The Effect of Play Activities Using Magnetic Letter Media

The Wilcoxon Signed Rank Test was conducted to determine the significance of changes within each group. Results are presented in Table 6.

Table 6. Wilcoxon Signed Rank Test Results

Statistic	*Experimental Group*	*Control Group*	*Decision*
Z	-2.807	-2.539	
Asymp. Sig. (2-tailed)	0.005	0.011	
Result	H1 accepted	H1 accepted	Significant (p<0.05)

The Wilcoxon test yielded a significance value of 0,005 (Z = -2.807) for the experimental group and 0,011 (Z = -2.539) for the control group. Both values are below the 0,05 threshold, indicating significant pre-to-post-test improvement in both group. Crucially, the experimental group's significance value (0.005) is lower than the control group's (0.011), and its mean scope gain (9.9 points) is substantially greater. These findings confirm that H1 is accepted: play activities using magnetic letter media significantly enhance early literacy skills in children aged 5-6 years at Makassar of Islam Al-Abrar Kindergarten.

DISCUSSION

The findings of this study demonstrate that play activities using magnetic letter media provide a positive contribution to early literacy development in children aged 5-6 years. This aligns with the theoretical framework underpinning the study. According to Piaget's cognitive development theory, children aged 5-6 years are in the preoperational stage, during which they begin using symbols but still require concrete objects to comprehend concepts (Piaget, in Purnamasari, 2024). Magnetic letter media, with is colorful, three-dimensional, manipulable letter components, directly addresses this developmental characteristic by providing concrete representations of abstract letter symbols.

The significant improvement in the experimental group (mean gain = 9.9 points; p = 0.005) compared to the control group (mean gain = 2.6 points; p = 0.011) reflects the effectiveness of multisensory learning facilitated by magnetic letters. Children were not merely passive recipients of information; they actively touched, selected, arranged, and attached letters on the magnetic board, engaging visual, tactile, and kinaesthetic modalities simultaneously. Emphasized that multisensory engagement is critical for letter-sound association in young learners, and this study's findings affirm that principle.

The dramatic shift in the experimental group's post-test distribution – from 0% to 60% achieving the Very Good (VG) category – illustrates that play-based learning with concrete media can meaningfully accelerate literacy development within a relatively short intervention period of six sessions. This is consistent with Setiawati et al. (2025), who reported that

magnetic alphabet media enhanced attention, engagement, and letter recognition through structured, visually-based play. The current study extends this finding to a broader set of literacy indicators, including phonological awareness and word construction, demonstrating that the benefits of magnetic letter media are not limited to letter naming alone.

Furthermore, the study corroborates Isnaini and Sukmawati (2023), who found that magnetic board activities made letter learning more concrete and interactive. The present study adds to this evidence base by showing that when magnetic letter activities are systematically structured. Children progressed from letter recognition (Sessions 1-2) to phonological awareness (Sessions 3-4) and finally to word construction and beginning reading (Sessions 5-6), reflecting the developmental literacy sequence described by Teale and Sulzby (in Irayana and Assyauqi, 2025)

These result can also interpreted through Vygotsky's sociocultural theory, which complements the Piagetian framework introduced earlier. While Piaget emphasizes children's readiness for concrete experience at the preoperational stage, Vygotsky's concept of the Zone of Proximal Development highlight the role of teacher scaffolding in extending what a child can achieve beyond independent effort. In this study, the structured progression of activities-from letter recognition, to phonological awareness, to word construction-mirrors a scaffolded sequence in which teachers guided children toward increasingly complex literacy tasks using the magnetic letter media as a mediating tool. The significant gains observed in the experimental group suggest that the combination of a concrete, manipulable medium with teacher-guided, sequenced instruction created a zone in which children could accomplish literacy tasks that would likely have exceeded their independent capability, reinforcing the complementary value of cognitive-develpomental and sociocultural perspectives in explaining the intervention's effectiviness.

It is noteworthy that the control group also showed significant improvement ($p = 0.011$), suggesting that any structured literacy intervention produces gains over conventional classroom practice. However, the substantially greater effect size in the experimental group highlights the added value of magnetic letter media as an innovative instructional tool. This finding supports Suryana and Desmila (2022), who argued that through play, children have opportunities to explore their environment, interact with peers and teachers, and develop various aspects, including language and literacy competencies.

It should be acknowledged that the control group's wooden letter media is, like the magnetic letter media, a three-dimensional, visual, and manipulable teaching aid, meaning that the multisensory distinction between the two media is inherently narrow. The substantially greater gain observed in the experimental group (3.8 times that of the control group) is therefore unlikely to be explained by three-dimensionality alone, but rather by properties specific to the magnetic mechanism itself. Unlike wooden letters, which must be picked up, positioned, and held in place by the child's own fine motor control to avoid slipping or toppling, magnetic letters self-

adhere to the board on contact. This immediate, low-effort adhesion allows children with still-developing fine motor skills to focus their attention on the cognitive task-recognizing, matching, and sequencing letters-rather than on the physical challenge of balancing or arranging pieces. The magnetic board also affords quick, low-friction correction: a misplaced letter can be lifted and reattached instantly, encouraging trial-and-error exploration and sustained concentration without the frustration of pieces falling over, which is a common occurrence with freestanding wooden blocks. In addition, the flat magnetic board consolidates all letters within a single, stable visual field, which likely reduces extraneous cognitive load and helps children maintain focused attention across a full activity session compared to loose wooden pieces on a tabletop. These mechanical differences-ease of attachment, correction, and visual consolidation-offer a plausible explanation for why the experimental group's improvement so markedly exceeded that of the control group, beyond the shared multisensory nature of both media.

Practically, the advantages of magnetic letters media in this study include its ability to attract children's attention through colorful design, its flexibility for various activity modifications, its support for children who have not yet developed fine motor skills for writing, and its capacity to be used for both individual and small-group activities. The main limitations noted include the risk of magnetic pieces being lost or scattered and the difficulty of simultaneous whole-class use given limited sets of materials.

Several limitations of this study should be acknowledged. The relatively small sample size (n=20, drawn from a single kindergarten) limits the extent to which findings can be generalized to the broader population of Indonesian early childhood learners. The use of a quasi-experimental, non-randomized design, while practical within an existing classroom structure, leaves open the possibility that unmeasured differences between the Madinah and Mina classes-such as prior teacher practices or classroom dynamics-partially contributed to the observed gap in outcomes. The intervention period of approximately one month, comprising only six treatment sessions, is also relatively brief for assessing whether gains in early literacy are sustained over time; without a delayed post-test, it remains unclear whether the experimental group's advantage would persist once the novelty of the magnetic letter media diminishes. Additionally, the pre-test and post-test assessments were administered and scored by a single observer without a second rater to establish inter-rater reliability, which may introduce a degree of subjectivity into the scoring of children's letter-recognition and phonological-awareness performance.

Despite these limitations, the findings carry practical implications for early childhood institutions, particularly those operating within an Islamic educational framework such as Makassar of Islam Al-Abrar Kindergarten. Given that the Qur'anic emphasis on reading positions literacy as both a cognitive and a spiritual undertaking, teachers in Islamic kindergartens may consider integrating structured, play-based letter media-such as magnetic boards-into daily learning routines not merely as a secular instructional tool, but as an early step in preparing children to engage meaningfully with the

Qur'an and other religious texts later in their education. Teacher training programs at Islamic early childhood institutions could accordingly incorporate guidance on selecting and using multisensory media that combine concrete, manipulable materials with opportunities for repeated practice and immediate self-correction, the mechanical properties this study suggests are central to the effectiveness of magnetic letter media.

CONCLUSION

This study concludes that: (1) the use of magnetic letter media provided positive description of learning implementation, with children demonstrating increased enthusiasm, engagement, and improvement across all three early literacy indicators; (2) children's early literacy skills improved significantly in the experimental group, with the mean score rising from 28,4 (pre-test) to 38,3 (post-test), while the control group showed a more modest improvement from 27,4 to 30,0; and (3) play activities using magnetic letter media significantly influenced early literacy skills of children aged 5-6 years at Makassar of Islam Al-Abrar Kindergarten, as confirmed by a Wilcoxon significance value of 0,005 ($p < 0,05$) and a mean gain of 9,9 points in the experimental group compared to 2,6 points in the control group.

The implications of these findings suggest that magnetic letter media should be more widely adopted as a learning tool in early childhood education settings, particularly for literacy development programs. Future research is encouraged to examine the effects of magnetic letter media with larger samples, longer intervention periods, and in combination with other innovative media to further explore its potential for optimizing early literacy outcomes in young children.

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