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Development of Interactive Wordwall-Based Media to Enhance Letter Symbol Recognition Ability in Children Aged 5–6 Years

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ABSTRACT

Language development is a crucial aspect that must be supported by the child's environment, including school, family, and society. Observations at TK Aisyiyah 02 Surabaya showed that some children still struggle to recognize similar-looking letters such as b, d, m, and n. The learning media used were limited and the monotonous teaching methods made children easily bored and less focused. This study aims to develop an interactive learning media using Wordwall, based on the ADDIE development model. The media was designed as an engaging game including letter recognition, matching letters with pictures, and letter sound pronunciation. Validation results showed that the media is highly feasible, with a material expert score of 89.29% and a media expert score of 92.5%. Practical teacher interviews also confirmed that the media is suitable for early childhood learning styles, supporting visual and auditory learning, and

increasing children's enthusiasm and focus. The trials were conducted using a one-group pretest-posttest design on two small groups. The Shapiro-Wilk normality test showed that the data were not normally distributed, leading to the use of the Wilcoxon test. The Wilcoxon test result showed a significance value of 0.001 ($p < 0.05$), indicating a significant difference between the pretest and posttest scores. Learning improvements were also evidenced by the N-Gain Score of 0.86 in class B1 and 0.88 in class B2, both categorized as high. Thus, the interactive media based on wordwall proved to be effective in improving the ability to recognize similar-looking letters in early childhood through a play-based learning approach.

Introduction

Early Childhood Education (ECE) is a crucial initial stage in the national education system as it plays a significant role in shaping children's character, moral values, and basic skills. During the age of 0–6 years, often referred to as the golden age, children experience rapid physical and psychological development. This period is considered critical as it serves as the primary foundation for optimally building a child's potential (Simatupang dan Rosalianisa, 2021). One important aspect of early childhood development is language ability, which enables children to communicate, express emotions, and understand information from their surroundings (Firdaus, 2019). According to Hidayati et al., (2022) children's language development encompasses

four main aspects: listening, speaking, reading, and writing. Among these four aspects, reading is a vital foundation that must be stimulated from an early age. Reading in early childhood is not only related to recognizing words but is also closely linked to the introduction of letter symbols, which form the basis of early literacy skills Rakimahwati et al. (2018). Ruddell, as cited in Aulina (2012), explains that reading is a process of using language that involves decoding symbols and understanding meanings. Dhieni (2011) therefore, the introduction of letter symbols is an essential initial step in early reading skills, which involves activities such as recognizing letter shapes, associating them with sounds, and understanding their meanings (Nasution dan Simaremare, 2019).

However, observations made by the researcher at Aisyiyah Kindergarten 02 Surabaya indicate that some children aged 5–6 years still struggle to recognize letter symbols, particularly similar letters such as b, d, m, and n. Children tend to have difficulty pronouncing the sounds of the letters pointed out by the teacher and have not yet been able to connect letter symbols with objects in their environment. Additionally, the learning media used by teachers are still limited to blackboards, books, and student worksheets (LKA), making the learning process monotonous and boring. The lack of media variation and the suboptimal use of technology in learning have resulted in insufficient stimulation of children's language abilities. In fact, the use

of interactive media that aligns with the principles of early childhood learning, such as learning through play, is essential. One relevant media that meets this need is Wordwall, an interactive learning media based on a web application that offers a variety of educational games. This media facilitates visual, auditory, and kinesthetic approaches that are highly suitable for the learning styles of young children. Wordwall has also been proven to enhance student engagement and motivation due to its attractive and responsive presentation of material.

The integration of interactive digital media in early childhood education has gained increasing scholarly attention, particularly in relation to language and literacy development. One widely used digital platform is Wordwall, which offers interactive, game-based learning experiences that align with young children's developmental characteristics.

Mulyawati and Budiarti (2024) investigated the effect of Wordwall media on early childhood language skills at TKIT Al-Kaukaba using a quasi-experimental design. Their findings demonstrated a significant difference in language proficiency between children exposed to Wordwall-based learning and those who experienced conventional instruction. This study confirms that Wordwall media can effectively enhance children's language abilities through interactive and engaging learning activities. However, the scope of language skills examined in this study was broad and did not focus specifically on foundational

literacy components such as letter symbol recognition.

Similarly, Mawaddah and Syaya (2024) examined the impact of Word Wall media on vocabulary acquisition among children aged 5–6 years. Using a one-group pretest–posttest design, the study revealed a substantial increase in children's vocabulary mastery after the implementation of Word Wall media. In addition to quantitative gains, observational data indicated heightened student engagement and interest. While this study reinforces the effectiveness of Wordwall as a visual and interactive medium for language development, it concentrates primarily on vocabulary growth rather than early literacy skills related to letter recognition.

Further evidence of the pedagogical value of Wordwall-based media is provided by Gustini and Yuliantina (2025), who developed and validated Wordwall.net-based learning media to improve speaking skills in children with speech delay. Employing the ADDIE development model, the study involved expert validation from media specialists, early childhood educators, and speech therapists. The results indicated that the developed media was highly feasible and suitable for educational and therapeutic use. Although this study highlights the inclusivity and adaptability of Wordwall-based media, its focus lies on speaking skills and special-needs contexts, rather than on typically developing children's early literacy abilities.

In a broader developmental context, Handayani et al. (2025)

explored the use of Wordwall-assisted educational games to stimulate early childhood cognitive abilities. Their development research demonstrated that Wordwall-based games were not only feasible but also effective in enhancing children's cognitive outcomes. This study emphasizes the potential of Wordwall as an interactive digital medium that supports meaningful learning experiences. Nevertheless, the research centers on general cognitive development and does not specifically address literacy-related outcomes such as letter symbol recognition.

Moreover, Supriyadi et al. (2025) examined the influence of teacher competence and the use of interactive Wordwall media on early childhood literacy skills through a quantitative survey approach. The results indicated that both teacher competence and the use of interactive Wordwall media positively and significantly affected early literacy abilities. This study provides empirical evidence that Wordwall media contributes to early literacy development. However, literacy skills in this research are treated as a composite construct, without isolating specific sub-skills such as the recognition of letter symbols.

Based on the review of previous studies, it is evident that Wordwall-based interactive media has been widely proven to enhance various aspects of early childhood development, including language skills, vocabulary acquisition, speaking abilities, cognitive development, and general early literacy. However, several research gaps remain.

First, most existing studies focus on broad language or literacy outcomes, while limited attention has been given to letter symbol recognition as a foundational early literacy skill, particularly for children aged 5–6 years who are in the critical pre-reading stage. Second, although some studies adopt experimental or survey methods, there is still a lack of development-oriented research that systematically designs, validates, and evaluates interactive Wordwall-based media specifically tailored to letter symbol recognition. Third, several studies emphasize effectiveness without sufficiently addressing the instructional design characteristics of the developed media that align with early childhood learning principles.

Therefore, the study titled "Development of Interactive Wordwall-Based Media on Letter Symbol Recognition Ability of Children Aged 5–6 Years" is necessary and relevant. This research aims to fill these gaps by developing and validating an interactive Wordwall-based learning medium that specifically targets letter symbol recognition, thereby contributing both theoretically and practically to early childhood literacy education.

Methods

This type of research is Research and Development (R&D) using the ADDIE model (Branch, 2009) (Sugiyono, 2016). The subjects of the trial are children in Group B aged 5-6. Data were collected through observations, interviews, and validation instruments from content

experts, media experts, and practitioners. The trials were conducted using one-on-one testing with 5 children and small group testing with 30 children. The design for the small group trial employed a one-group pretest-posttest approach (Creswell, 2018). Data analysis utilized the Shapiro-Wilk normality test and the nonparametric Wilcoxon test due to the data not being normally distributed, with the effectiveness improvement calculated using the N-Gain Score.

Result and Discussions

The development process using the ADDIE model includes the stages of analysis, design, development, implementation, and evaluation. The media was developed in the form of interactive games that include letter recognition, matching letters with images, and audio pronunciation. A normality test was conducted to determine whether the pretest and posttest data were normally distributed. The test used was the Shapiro-Wilk test, with the following results:

Table 1. Normality Test Results

		Shapiro-Wilk		
	Kelas	***Statistik***	***df***	***Sig.***
Hasil	Pretest B1	*.953*	*15*	*.557*
	Posttest B1	*.768*	*15*	*.001*
	Pretest B2	*.816*	*15*	*.006*
	Posttest B2	*.646*	*15*	*.000*

Based on the results, only the Pretest B1 data was normally distributed ($p > 0.05$), while the others were not normally distributed ($p < 0.05$). Therefore, hypothesis testing was conducted using the non-

parametric Wilcoxon test. The Wilcoxon test was used to examine the differences between the pretest and posttest scores.

Tabel 2. Wilcoxon Test for Class B1

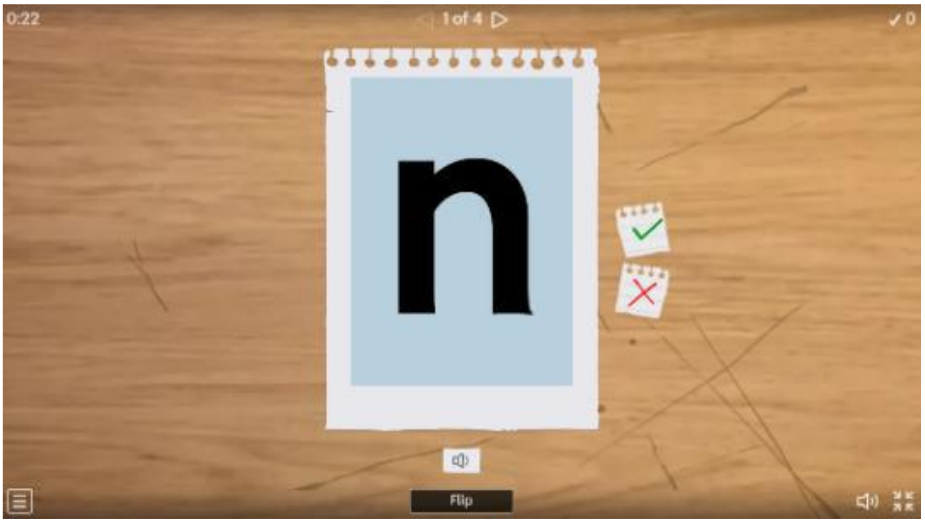
Test Statistics[a]	
	POSTTESTB1-PRETESTB1
Z	- 3.434[b]
Asymp. Sig. (2-tailed)	.001

Tabel 3. Wilcoxon Test for Class B2

Test Statistics[a]	
	POSTTESTB2-PRETESTB2
Z	- 3.448[b]
Asymp. Sig. (2-tailed)	.001

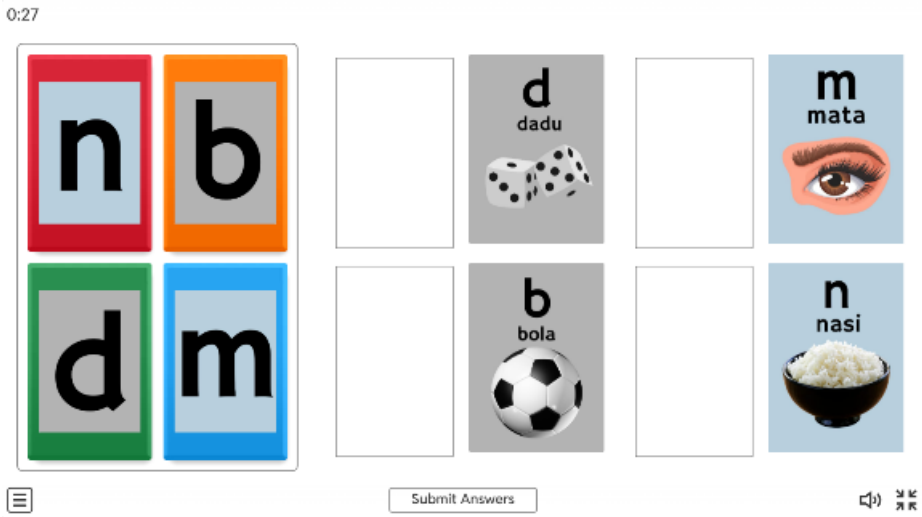
The results indicated a significant difference ($p < 0.05$) between the pretest and posttest scores in both classes. The negative Z value indicates that the posttest scores were higher than the pretest scores. This means that Wordwall-based interactive media significantly enhances children's ability to recognize letter symbols. To measure the effectiveness of the improvement, the N-Gain Score formula was used. The average N-Gain score for both classes was 0.86 for class B1 and 0.88 for class B2, both of which fall into the high category.

Figure 1. Design letter of wordwall



The findings of this study support the opinion of Rohmatin (2024), which states that interactive media can enhance children's participation and interest in learning. Wordwall is designed with visual, audio, and enjoyable game elements in accordance with the principles of learning through play emphasized (Maarang et al., 2024; Ikromatus dan Maulidiyah, 2024). The success of Wordwall in improving the ability to recognize letter symbols is also related to the symbol recognition theory from (Rakimahwati et al., 2018), which states that young children begin to recognize letters by associating the visual shapes of letter symbols with their sounds.

Figure 2. Design letter of wordwall with picture



This media helps children associate letters with relevant images and sounds. Based on these results, the use of Wordwall-based interactive media can increase children's interest and motivation in learning, leading to improved learning quality as the learning process becomes more optimal and enhances children's understanding of the material presented.

The findings of this study demonstrate that the interactive Wordwall-based media developed through the ADDIE model is effective in improving the letter symbol recognition ability of children aged 5–6 years, particularly in distinguishing visually similar letters such as *b*, *d*, *m*, and *n*. This effectiveness is evidenced by the statistically significant differences between pretest and posttest scores in both experimental classes, as indicated by the Wilcoxon test results ($p = 0.001$), as well as the high N-Gain scores achieved in class B1 (0.86) and class

B2 (0.88), which fall within the high improvement category.

These results are consistent with theoretical perspectives on early literacy development, which emphasize that letter recognition is a foundational skill in early reading and language acquisition. Rakimahwati et al. (2018) argue that young children recognize letters most effectively when visual forms are consistently associated with corresponding sounds and meaningful representations. The Wordwall-based media developed in this study integrates visual symbols, audio pronunciation, and image associations, thereby facilitating multisensory learning experiences that support this process. This alignment explains why children showed marked improvement in recognizing and differentiating similar-looking letter symbols after the intervention.

The findings also corroborate previous empirical studies that highlight the pedagogical value of Wordwall as an interactive learning medium in early childhood education. For instance, Mulyawati and Budiarti (2024) found that Wordwall-based learning significantly enhanced children's overall language abilities compared to conventional methods. Similarly, Mawaddah and Syaya (2024) reported notable gains in vocabulary acquisition and learner engagement following the use of Wordwall media. Although these studies did not specifically focus on letter symbol recognition, their results support the

present study's conclusion that Wordwall effectively enhances language-related skills through interactive and game-based learning environments.

Moreover, the high feasibility scores obtained from material experts (89.29%) and media experts (92.5%) reinforce the instructional quality of the developed media. These findings are in line with Gustini and Yuliantina (2025), who reported that Wordwall-based media developed using the ADDIE model was highly valid and appropriate for improving speaking skills in children with speech delay. While their study addressed a different developmental domain and population, both studies confirm that systematic instructional design combined with interactive digital media results in learning tools that are pedagogically sound and developmentally appropriate.

In addition, the positive learning outcomes observed in this study align with the principles of play-based learning, which emphasize enjoyment, active participation, and intrinsic motivation as key drivers of effective learning in early childhood. Rohmatin (2024) and Maarang et al. (2024) assert that interactive media incorporating visual, auditory, and game elements can increase children's attention, motivation, and participation. The Wordwall-based activities used in this study—such as letter matching, image association, and sound recognition—provided a playful yet structured learning environment that encouraged children

to engage actively with letter symbols, leading to improved learning outcomes.

Furthermore, this study extends previous research by addressing a specific gap in the literature. While earlier studies have examined Wordwall's impact on general language skills, vocabulary, speaking ability, cognitive development, and overall literacy (Handayani et al., 2025; Supriyadi et al., 2025), few have isolated letter symbol recognition as a distinct early literacy skill. By focusing explicitly on this foundational component, the present study contributes more targeted empirical evidence regarding the role of interactive digital media in supporting pre-reading development among children aged 5–6 years.

Overall, the findings confirm that Wordwall-based interactive media not only enhances children's ability to recognize letter symbols but also supports meaningful, engaging, and developmentally appropriate learning experiences. These results strengthen existing research on digital game-based learning in early childhood education and underscore the importance of integrating well-designed interactive media to support early literacy development.

Conclusion

Based on the research findings, it can be concluded that Wordwall-based interactive media is proven to be highly feasible and effective in enhancing the ability to recognize similar letter symbols (b, d, m, n) in

children aged 5–6 years, with validation results from content experts at 89.29% and media experts at 92.5%. Additionally, the Wilcoxon test results indicate a significant difference between the pretest and posttest scores (significance 0.001), supported by high N-Gain Scores of 0.86 (class B1) and 0.88 (class B2). This success aligns with game-based learning theory and the play-based learning approach, where the visual, audio, and game elements of Wordwall effectively capture attention and provide multisensory stimulation that enhances language and cognitive abilities in early childhood.

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