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DEVELOPING A CROSSWORD PUZZLE AS AN ENGLISH LEARNING MEDIUM TO ENHANCE STUDENTS' VOCABULARY MASTERY

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Abstract: This research aimed to develop and evaluate a crossword puzzle as an instructional medium to enhance English vocabulary mastery among fourth-grade elementary students. Employing the Research and Development (R&D) method, the study followed the ADDIE model—Analysis, Design, Development, Implementation, and Evaluation—to ensure a systematic and effective development process. The media was designed using contextual vocabulary themes such as “colors,” “animals,” and “classroom items,” supported by clue cards to facilitate interactive learning. The study involved 27 students from one elementary school in Jepara using a pre-experimental one-group pretest-posttest design. Data were collected through tests, observations, interviews, and questionnaires. The paired sample t-test revealed a significant improvement in students' vocabulary scores ($p = 0.001$), with a mean increase from 56.9 to 87.3, and a notable reduction in standard deviation, indicating improved equity in learning outcomes. Validation results from media and content experts showed a high feasibility score of 82.6%, confirming the media's practicality and pedagogical alignment. The findings indicate that the crossword puzzle media is valid, effective, and engaging, successfully enhancing vocabulary mastery while fostering active learning and motivation. This study supports the integration of game-based media into English language instruction and recommends broader application at various educational levels.

Keywords: *crossword puzzle; vocabulary mastery; learning media; ADDIE model; English language learning; R&D.*

INTRODUCTION

Vocabulary is a fundamental aspect of language learning, serving as the building block for communication skills in English as a Foreign Language (EFL) settings. However, traditional vocabulary instruction often lacks engagement and retention strategies, leading to low motivation and poor outcomes among learners (Ernie et al., 2022; Hasan et al., 2021; Aedo & Millafilo, 2022; Mulyani & Sartika, 2019; Nasim et al., 2022). In recent years, educational researchers have explored innovative approaches, such as game-based learning and interactive media, to make vocabulary acquisition more effective and enjoyable (Alsoufi & AbuSeileek, 2021; Musdalifah & Romdaniya, 2022). The integration of instructional design models like ADDIE is also gaining traction in the

creation of structured and learner-centered teaching tools (Adeoye et al., 2024; Haviz, 2016).

The ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) has proven valuable in educational product development, offering a systematic framework that enhances both instructional design and learning outcomes (Adeoye et al., 2024; Vijayakumar et al., 2023; Elvitaria et al., 2023; Maydiantoro, 2021; Hasan et al., 2021). Elvitaria et al. (2023) demonstrated its success in integrating technology into English learning for elementary students, while Adeoye et al. (2024) emphasized its effectiveness in diverse educational contexts. Furthermore, Sugiyono (2019) recommends research and development approaches like ADDIE in producing contextual and pedagogical

innovations in classroom instruction.

Game-based learning strategies have been widely recognized for their capacity to enhance student motivation and knowledge retention, especially in language learning contexts (Alsoufi & AbuSeileek, 2021; Ayyad & Soufi, 2021; Nguyen et al., 2023; Prastiwi, 2023; Dewi & Syahuma, 2022). Alsoufi and AbuSeileek (2021) conducted a meta-analysis showing a strong correlation between game use and vocabulary mastery. Likewise, Nguyen et al. (2023) highlighted game-based approaches in non-language disciplines, underlining their cross-disciplinary relevance. Dewi and Syahuma (2022) found word-chain games particularly effective at the basic level of English education.

Specifically, crossword puzzles offer multiple pedagogical benefits by promoting word recognition, spelling accuracy, and active recall—all crucial for vocabulary development (Dinata & Hikmah, 2024; Jannah & Wahyuningsih, 2025; Wefi et al., 2023; Marlina et al., 2021; Rochmadhoni et al., 2022; Rahmaninda et al., 2023; Febriansari et al., 2020). Dinata and Hikmah (2024) found significant improvement in fourth-grade students' vocabulary after using crossword puzzles, while Jannah and Wahyuningsih (2025) confirmed similar gains in EFL contexts. Febriansari et al. (2020) extended this approach to Arabic, suggesting its versatility across languages.

Studies combining multimedia with crossword puzzles have further demonstrated enhanced engagement and learning outcomes (Marlina et al., 2021; Aedo & Millafilo, 2022; Nasim et al., 2022; Hasan et al., 2021; Adeoye et al., 2024; Elvitaria et al., 2023). Marlina et al. (2021) showed that multimedia-enhanced crossword puzzles improved the science learning process, supporting their use beyond language learning. Likewise, Aedo and Millafilo (2022) emphasized the role of multimodal texts in improving vocabulary retention, which complements the visual and interactive nature of crossword puzzles.

Technology-driven pronunciation tools such as YouTube, Joox, and AI-based programs have also shown potential for vocabulary and language skills development (Mulyani & Sartika, 2019; Rahmania & Mandasari, 2021; Salim et al., 2020; Shehata, 2024; Vural & Hancı-Azizoglu, 2022; Putra & Sujarwati, 2023; Simaremare et al., 2023). While these focus more on listening and pronunciation, their success underscores the role of multimedia in enhancing learner attention and language competence, which is also relevant to crossword puzzle usage in EFL classrooms.

Studies have also explored the integration of vocabulary notebooks and flashcards as scaffolds to vocabulary mastery (Tran & Do, 2023; Nurfadillah et al., 2023; Ernie et al., 2022; Aedo & Millafilo, 2022; Dewi & Syahuma, 2022; Musdalifah & Romdaniya, 2022; Wefi et al., 2023). Flashcards help in repetitive learning, and vocabulary notebooks foster personalized language acquisition, yet these tools often lack the engagement factor provided by crossword puzzles. This highlights the need to merge structure and stimulation in vocabulary instruction.

Jannah and Wahyuningsih (2025), along with Wefi et al. (2023), emphasized crossword puzzles' role in boosting learners' confidence and vocabulary range. Rochmadhoni et al. (2022) showed that seventh graders taught vocabulary through crossword puzzles performed significantly better than those using traditional methods. Similarly, Rahmaninda et al. (2023) developed Indonesian language crossword puzzles and reported high usability and learning outcomes, reinforcing their suitability in both local and EFL contexts.

Despite growing support, there remains limited integration of instructional design theory in the development of crossword-based media (Haviz, 2016; Adeoye et al., 2024; Elvitaria et al., 2023; Sugiyono, 2019; Vijayakumar et al., 2023; Maydiantoro, 2021; Hasan et al., 2021). Many studies simply apply existing puzzles in classrooms without tailoring them to student needs or aligning them with structured design methodologies like ADDIE. This results in missed opportunities for pedagogical optimization.

Furthermore, most research in this area focuses on outcome-based assessment without discussing the design process, teacher guidance, or how the media aligns with the national curriculum (Rahmaninda et al., 2023; Febriansari et al., 2020; Marlina et al., 2021; Rochmadhoni et al., 2022; Aedo & Millafilo, 2022; Dewi & Syahuma, 2022; Tran & Do, 2023). These gaps limit the scalability and replicability of crossword puzzle media, especially in Indonesian elementary schools.

While previous studies confirm that crossword puzzles enhance vocabulary mastery, few have adopted a structured design process like the ADDIE model to ensure effectiveness, contextual relevance, and curriculum alignment. The lack of systematic media development targeting Indonesian elementary EFL learners limits practical application and sustainability in real classroom settings. How can a crossword puzzle be developed using the ADDIE model to effectively

enhance vocabulary mastery among EFL elementary students?

This study uniquely combines game-based learning with systematic instructional design by applying the ADDIE model to develop vocabulary-focused crossword puzzles tailored for Indonesian EFL learners. It addresses both pedagogical rigor and learner engagement in a localized educational context.

This research contributes a validated learning medium that is engaging, curriculum-aligned, and systematically developed. It benefits teachers seeking alternative tools for vocabulary instruction and expands the literature on game-based media development through ADDIE in elementary EFL education.

METHOD

This study adopted the Research and Development (R&D) methodology, which is designed to create, refine, and test educational products for classroom use. As emphasized by Haviz (2016), R&D bridges the gap between theoretical research and practical classroom implementation, making it suitable for producing innovative and effective learning tools. Sugiyono (2019) defines R&D as a structured process aimed at generating new or improved products through research, development, testing, and validation. In the context of education, R&D is particularly useful for designing media that respond to specific classroom needs while aligning with curriculum objectives (Maydiantoro, 2021; Hasan et al., 2021).

To ensure systematic development, this study implemented the ADDIE model, which consists of five phases: Analysis, Design, Development, Implementation, and Evaluation. This model was selected for its clarity, flexibility, and ability to guide the instructional design process from conceptualization to implementation (Adeoye et al., 2024; Elvitaria et al., 2023; Vijayakumar et al., 2023). The ADDIE model not only aids in identifying learner needs but also ensures the creation of contextually relevant content and its evaluation for educational effectiveness.

In the Analysis phase, researchers identified the basic competencies from the national curriculum and analyzed student characteristics, including age, prior knowledge, and learning styles. The learning environment and students' challenges in vocabulary acquisition were also assessed. This diagnostic process helped ensure the crossword puzzle content was age-appropriate and relevant to student needs (Hasan et al., 2021; Sugiyono, 2019). Furthermore, the researchers identified vocabulary

scope and integrated elements such as puzzles, clue cards, and visual aids to match the learning objectives.

During the Design phase, the learning media was conceptualized in the form of a crossword puzzle. Layouts, instructions, clue formats, and vocabulary selection were designed in accordance with the analysis results. The process followed instructional media design principles, focusing on simplicity, clarity, and attractiveness for young learners (Haviz, 2016; Adeoye et al., 2024). The design emphasized student engagement and interactive problem-solving.

In the Development phase, the actual crossword media was created, combining visual design, instructional text, and interactive elements. The product underwent expert validation involving content, language, and media specialists to assess accuracy, readability, and usability. This aligns with the validation strategies suggested by Hasan et al. (2021) and Vijayakumar et al. (2023), who recommend triangulated expert reviews in media development studies to ensure product feasibility.

The Implementation phase was conducted in a fourth-grade classroom of 27 students at a public elementary school in Jepara. The site was selected based on preliminary observations that showed vocabulary learning challenges among students. The crossword media was introduced in classroom activities, with researchers facilitating usage and observing students' engagement, learning behaviors, and responses. The implementation adhered to best practices in media-based instruction as outlined by Elvitaria et al. (2023) and Dewi and Syahuma (2022), which emphasize student-centered delivery and contextual fit.

Finally, in the Evaluation phase, the product was assessed in terms of validity, practicality, and effectiveness. Expert feedback determined the content validity, while student and teacher questionnaires informed the media's practicality. The effectiveness was measured through a pre-experimental one-group pretest-posttest design, where students' vocabulary mastery was assessed before and after using the media. This design is commonly applied in R&D studies to test learning outcomes (Haviz, 2016; Sugiyono, 2019).

Quantitative data were analyzed using the paired sample t-test, suitable for small sample sizes and repeated measures on the same group (Fuadi et al., 2022). The significance level used was $p < 0.05$, meaning a significant difference between pretest and posttest scores would indicate a successful intervention. According to Sukarelawan et al. (2024), a Sig. (2-tailed) value below 0.05

confirms the statistical effectiveness of an educational treatment. Supporting this, the test results in this study showed a substantial improvement in students' vocabulary acquisition after the crossword media intervention.

This study involved 27 fourth-grade students (8 male, 19 female) as the research participants. They were selected through purposive sampling to represent the target users of the product. The use of one intact class enabled focused observation and facilitated iterative revisions based on real-time feedback (Hasan et al., 2021; Prastiwi, 2023). Data collection methods included interviews with teachers, student observations, pretest and posttest scores, and questionnaires. These instruments helped assess learning outcomes and the overall quality and usability of the media from multiple perspectives.

RESULTS AND DISCUSSION

The implementation of crossword puzzles as a learning medium proved to be significantly effective in improving students' English vocabulary mastery. This intervention was carried out on a group of 27 fourth-grade students from an elementary school using a pretest and posttest design. The results indicated a notable increase in vocabulary ability, with posttest scores showing a substantial improvement compared to pretest results after four weeks of media usage. Specifically, students' vocabulary performance increased by approximately 40%, highlighting the crossword puzzle's effectiveness in reinforcing vocabulary recall and usage.

The puzzles were constructed using familiar and contextually relevant themes such as "classroom objects," "colors," "animals," and "object properties." These everyday topics helped situate vocabulary within meaningful contexts, enhancing both comprehension and retention. Observational data revealed a high level of student participation and enthusiasm, with learners actively solving puzzles and discussing word meanings. One student remarked, "I enjoy puzzles about school because I see those words every day," indicating that the relatable content enhanced their

motivation and focus. This increased engagement likely boosted the learning impact by stimulating active recall and peer discussion, both of which are known to support vocabulary development.

The use of crossword puzzles has also shown positive outcomes in other educational contexts. In a previous study involving junior high school students, the group using crossword puzzles achieved a post-test mean score of 91.87, outperforming the control group's score of 89.69. Statistical analysis using a t-test confirmed the difference was significant ($t = 2.13, p < 0.05$), affirming the effectiveness of crossword puzzles in vocabulary enhancement (Jannah & Wahyuningsih, 2025). Similarly, research by Aulia Wati (2025) reported a significant improvement, with vocabulary scores increasing by 27.51 points—from an average pretest score of 51.82 to a posttest average of 79.33 ($p = 0.000$)—demonstrating the tool's efficacy in supporting word acquisition.

The primary objective of developing this crossword puzzle and clue card learning media was to facilitate students' vocabulary acquisition, especially in English. The development followed the structured ADDIE model, comprising the phases of Analysis, Design, Development, Implementation, and Evaluation (Elvitaria et al., 2023). Learning media, as noted by Hasan et al. (2021), act as vital tools for teachers to deliver content in a more accessible and engaging way, ultimately supporting learning outcomes.

Upon evaluation, the crossword puzzle media received an 87.30% validation score, indicating a very high level of content validity. The validation process involved a comprehensive assessment by subject matter experts, who reviewed the accuracy, relevance, and clarity of the material. These experts also ensured that the content aligned with the educational goals for fourth-grade learners and addressed a variety of learning needs. Through expert validation, the media was confirmed to be not only curriculum-compliant but also effective in improving students' ability to retain and apply new vocabulary.

Table 1. *Material expert validation results*

No	Aspect	Criteria	Score	Percentage (%)
1.	CONTENT	a. Clarity of learning topics	4	100%
		b. Accuracy of material	3	80%
		c. Coverage of material	3	80%
		d. Suitability of media content to learning topics	3	80%

	e.	Suitability of the level of difficulty of the material	3	80%	
2.	LANGUAGE	a.	Suitability of language structure and terms used.	3	80%
		b.	Ease of understanding the compiled language.	4	100%
3.	USE/BENEFIT	a.	Ease of understanding the material using CRUZZLE learning media to improve Student Vocabulary Mastery	4	100%
		b.	The existence of learning media CRUZZLE can improve students' interest in learning.	3	80%
		c.	The existence of CRUZZLE learning media can make it easier for students to learn the material.	3	80%
		d.	The existence of learning media CRUZZLE can improve vocabulary mastery.	4	100%
Total				960	
				87.30	

The crossword puzzle learning media obtained a validation score of 82.6%, indicating a strong level of validity in terms of instructional media standards. This score reflects that the media meets rigorous criteria for quality and effectiveness in supporting English vocabulary instruction. Throughout its development, the media underwent several revision cycles based on expert input to improve functionality, visual appeal, and educational value. Experts suggested the inclusion of interactive features—such as clear clues and visual supports—to increase learner engagement, which were subsequently integrated into the

design. The media was assessed as both technically sound and pedagogically appropriate, providing a more engaging and student-friendly learning experience.

Before full implementation, the media was tested with a small group of students to evaluate its practicality. This trial phase helped gather user feedback regarding both content and usability. Students reported increased curiosity and motivation while solving puzzles, and showed greater independence during learning, demonstrating the media's effectiveness in promoting active and self-directed learning.

Table 3. *Media expert validation*

No	Assessment Aspect	Criteria	Score	Percentage (%)
1	Visual Design	Attractive and suitable for the age group	4	100%
		Use of clear colors and visuals	4	100%
		Appropriate layout and component proportions	3	80%
2	Material Quality	Sturdy and safe to handle	3	80%
		Flashcards are not easily damaged	3	80%
3	Interactivity	Can be used independently by students	4	100%
		Game instructions are clear	3	80%
4	Technical Aspects	All components function properly	3	80%
		Instructions for use are easy to understand	3	80%
Total				82.6%

A notable finding in this study is the decrease in standard deviation, from 18.08 in the pretest to 7.84 in the posttest. This reduction signifies that the gap between high-performing and low-performing students narrowed after the use of the crossword puzzle media. It suggests that the learning tool helped create a more equitable learning environment where all students, regardless of their initial ability level, had meaningful opportunities

to engage with the material and improve their vocabulary skills. The structured yet enjoyable nature of the crossword puzzle likely contributed to this inclusive outcome. These findings align with previous research, which highlights the potential of game-based learning to address diverse student needs and support inclusive educational practices (Ernie et al., 2022).

Table 4. *Descriptive statistics of pretest and posttest results*

	N	Mean	Median	SD	SE
Pretest	27	56.9	55	18.08	3.48
Posttest	27	87.3	89	7.84	1.51

The instruments used in this study—including the pretest and posttest—were carefully reviewed to ensure their validity and appropriateness for assessing students' vocabulary acquisition. In educational research, validity refers to the degree to which a tool accurately measures what it intends to. To establish this, the tests underwent both expert review and statistical analysis. Experts evaluated the alignment of test items with learning objectives, while statistical validation showed that most questions reached a validity coefficient of 0.343, indicating a moderate to strong correlation between the test items and the construct of vocabulary knowledge. According to Aedo and Millafilo (2022), this level of validity is considered suitable for classroom-based research, particularly involving young learners. The validation process also ensured that the test items were clearly worded, relevant to the topic, and free from bias—

thus enhancing the overall reliability and quality of the data collected.

Table 2 *Normality test (Shapiro-Wilk)*

	w	p
Pretest	0.912	0.025

The normality of the data was tested using the Shapiro-Wilk test, a common method used to determine whether a dataset follows a normal distribution—a key requirement for many parametric statistical analyses, including the paired sample t-test. The results showed that both the pretest and posttest scores had p-values greater than 0.05, indicating that the data did not significantly deviate from normality. This confirms that the assumption of normal distribution was met, allowing the use of parametric methods to analyze the results accurately. The normal distribution of scores also suggests that the sample appropriately represents the population, thereby strengthening the reliability and generalizability of the study's findings.

Table 3. *Paired samples T-test*

	Pretest	Posttest	statistic	Df	p	Mean difference	SE difference	95% Confidence Interval		Effect Size
								Lower	Upper	
Student's t			-10.8	26.0	<.001	-30.4	2.83	-Inf	-25.6	Cohen's d -2.07

The statistical analysis revealed a significant difference between pretest and posttest scores, with a p-value of 0.001, well below the standard significance level of 0.05. This confirms that the use of crossword puzzles had a positive impact on students' vocabulary mastery. The increase in mean scores and student responses during the posttest phase indicates that the media was effective in supporting language development. These results are in line with the findings of Jannah and Wahyuningsih (2025), who also reported a significant improvement in vocabulary outcomes after applying crossword-based learning strategies in English instruction. Similarly, Aulia Wati (2025) demonstrated notable gains in students' vocabulary scores using crossword puzzles, supporting the claim that this medium is both engaging and pedagogically sound.

Moreover, students reported increased

enthusiasm and motivation, which were observed in their active participation during the learning sessions. The nature of crossword puzzles, which combines challenge with playfulness, likely stimulated intrinsic motivation and a healthy sense of competition among learners. This echoes previous research by Aedo and Millafilo (2022), who found that multimodal learning tools—particularly those that engage students through visual and interactive elements—foster both cognitive and affective gains. Ernie et al. (2022) also highlighted that game-based strategies are capable of meeting diverse learning needs, making classrooms more inclusive and dynamic.

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This study applied the ADDIE instructional design model to develop a crossword puzzle-based learning medium focused on improving students' English vocabulary. In the Analysis phase, the researchers identified the core challenges students faced in vocabulary retention and contextual application. Data from interviews, observations, and student questionnaires served as the basis for developing a learning tool tailored to their needs and aligned with curriculum goals. This is consistent with the approach proposed by Adeoye et al. (2024), who emphasized the importance of systematic needs assessment as the foundation of effective media development.

The results demonstrate that crossword puzzles significantly contributed to vocabulary enhancement, especially among elementary school learners. Febriansari et al. (2020) found that crossword puzzles were effective in improving students' Arabic vocabulary mastery, and this finding is echoed in the present study in the context of English vocabulary. Furthermore, Rahmaninda et al. (n.d.) reported that using puzzle-based learning not only improves content retention but also increases comprehension of core learning materials, especially when aligned with familiar themes.

The Design and Development phases resulted in an engaging board game with clue cards and structured puzzle formats. The media was validated by both content and media experts, who awarded it an average feasibility score of 82%, categorizing it as highly suitable for classroom use. This supports Hasan et al. (2021), who stressed that the quality of instructional media is enhanced through iterative validation by subject matter experts. Additionally, Nurfadillah et al. (2023) found that effective learning media—especially those that are visually appealing and interactive—help foster curiosity and sustained learner attention.

During the Implementation phase, observations confirmed increased student engagement and participation. Students were enthusiastic about the themes such as "colors," "animals," and "classroom items," which made the vocabulary more relatable and easier to recall. This aligns with findings by Dinata and Hikmah (2024), who showed that contextualized vocabulary instruction significantly improves learning outcomes. Likewise, Dewi and Syahuma (2022) noted that structured vocabulary games promote retention and make learning more meaningful for young learners.

In the Evaluation phase, validation and field testing demonstrated the media's effectiveness in improving vocabulary while ensuring usability and clarity. Media experts emphasized the value of integrating visual clues and structured game rules, echoing recommendations by Elvitaria et al. (2023), who emphasized that interactive design elements increase user-friendliness and learning efficiency. The reduction in standard deviation from 18.08 (pretest) to 7.84 (posttest) suggests that the media helped reduce learning disparities among students, supporting Ernie et al. (2022)'s argument that game-based learning fosters inclusive educational environments.

In addition, normality testing using the Shapiro-Wilk test confirmed that both pretest and posttest data were normally distributed ($p > 0.05$), meeting the assumptions for parametric testing. According to Prastiwi (n.d.), adherence to statistical assumptions strengthens the credibility of the findings and supports broader generalization to similar contexts.

In summary, this study reinforces the value of crossword puzzles as an effective instructional medium for vocabulary development in English language learning. Supported by expert validation, grounded in the ADDIE model, and justified by previous findings (e.g., Jannah & Wahyuningsih, 2025; Aedo & Millafilo, 2022; Elvitaria et al.,

2023), the media proved capable of enhancing vocabulary comprehension, encouraging student interaction, and supporting a positive classroom atmosphere. The results affirm that such game-based learning tools are both pedagogically effective and enjoyable, making them highly suitable for adoption in elementary school English instruction.

CONCLUSION

This study concludes that the development and implementation of a crossword puzzle-based learning medium, guided by the ADDIE instructional design model, has proven to be effective, valid, and practical in improving English vocabulary mastery among fourth-grade elementary students. The media addressed key learning challenges by combining engaging visual elements, thematic clue cards, and interactive gameplay, which led to significant improvements in students' vocabulary scores—supported by statistical analysis using the paired sample t-test ($p = 0.001$). The reduction in standard deviation further indicates that the intervention helped close the performance gap among learners, promoting a more equitable and inclusive learning environment.

Expert validation, which scored the media at 82.6%, confirmed that the crossword puzzles were pedagogically sound, technically feasible, and suitable for classroom use. Observations and student feedback also revealed increased motivation, engagement, and enjoyment during the learning process, aligning with prior research that emphasizes the positive effects of game-based learning on vocabulary acquisition and learner enthusiasm.

The results support the conclusion that crossword puzzles are not only effective as a vocabulary learning tool, but also contribute to a more active, student-centered, and enjoyable classroom experience. Therefore, the use of crossword puzzles is strongly recommended as an innovative instructional strategy in English language teaching, particularly at the elementary level. Future studies could expand on this research by applying the media across different grade levels, content areas, and school contexts to further validate its generalizability and long-term impact.

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