

# Development of Puzzle Media Based on Culturally Responsive Learning to Improve Students' Reading Skills

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## ABSTRACT

This study aims to develop puzzle-based learning media based on Culturally Responsive Teaching (CRT) to improve the reading skills of first-grade students at SD Negeri 100309 Sibio-bio. This study uses the Research and Development (R&D) method with the ADDIE development model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. The research subjects were 18 first-grade elementary school students. Data collection techniques included tests, questionnaires, interviews, and documentation, while data analysis used quantitative and qualitative descriptive techniques based on percentages. The results of the study show that the CRT-based puzzle media developed meet the criteria of being valid, practical, and effective. Validation results showed scores of 77.3% from media experts, 80% from material experts, and 80% from language experts, categorized as valid. From the aspect of practicality, the teacher's response scored 86.2% and the students' response 86.5%, both of which fall into the very practical category. In addition, the effectiveness test results showed a significant improvement in students' reading skills, with the average pre-test score of 49.6 (low category) increasing to 91.1 (high category) in the post-test. An N-Gain score of 0.8 indicates a high improvement category.

## 1. INTRODUCTION

Education is a fundamental aspect that has a strategic role in improving the quality of human resources and determining the progress of a nation. Through education, individuals acquire the knowledge, skills, and values needed to face various life challenges (Iskandar, Mesiono, & Sit, 2025; Siregar, et al., 2022). One of the basic skills that forms the foundation of educational success is the ability to read. Reading not only functions as a means of obtaining information, but also as a tool to develop critical thinking skills, broaden horizons, and build students' academic competence (Azahra & Kusumawati, 2025; Rambe, et al., 2023). Therefore, mastery of reading skills needs to be instilled from the elementary education level as the main provision in the learning process at the next level. The importance of reading ability is also emphasized in Law Number 20 of 2003 concerning the National Education System, which places a reading culture as one of the principles of education implementation. Reading ability enables students to obtain various information that supports their intellectual and social development (Zahra & Sit, 2024; Anas & Sapri, 2022). Children who have good reading skills tend to more easily understand learning materials, access various sources of knowledge, and show more optimal academic development compared to children who still experience reading difficulties (Sapitri, Nasution, & Iskandar, 2023). Thus, the development of reading skills becomes one of the main priorities in elementary education. Reading is essentially a complex activity because it involves visual, cognitive, psycholinguistic, and metacognitive aspects simultaneously. Therefore, reading skills need to be taught systematically and continuously from an early age (Al-Jarf, 2026). From an Islamic perspective, the importance of

reading is also reflected in the words of Allah Swt. in QS. Al-‘Alaq verses 1–5, which command humans to read as an initial step in acquiring knowledge. This value indicates that reading is not only an academic necessity but also part of an effort to develop human potential comprehensively. Nevertheless, the reality on the ground shows that the reading ability of elementary school students still faces various obstacles. Based on observations and interviews with the first-grade homeroom teacher of SD Negeri 100309 Sibio-Bio, Angkola Timur District, South Tapanuli Regency, several problems were found in the students' reading ability. Some students still have difficulty recognizing letters in sentences, reading fluently, pronouncing words containing certain letters, connecting words in sentences correctly, and still spell out words when reading. In addition, the limited learning resources and low student interest in reading also contribute as factors that reinforce these problems. This condition shows that students' reading abilities still require attention and more effective learning innovations.

One approach considered relevant to address these challenges is Culturally Responsive Teaching (CRT). The CRT approach emphasizes the importance of integrating students' cultural backgrounds, values, and life experiences into the learning process so that a more meaningful, inclusive, and contextual learning experience is created (Rahayu, Anhar, & Retnoningsih, 2025). Through this approach, students not only gain academic knowledge but are also given space to recognize, appreciate, and develop their cultural identity. In reading instruction, CRT allows the use of learning materials and activities that are close to students' lives, thereby enhancing reading comprehension, learning motivation, and interest in reading. Puzzle media becomes increasingly potential if developed by integrating the principles of Culturally Responsive Teaching. The combination of puzzle media and the CRT approach allows the creation of learning media that is not only visually appealing but also relevant to the social and cultural environment of students (Maryatri, Sudigdo, & Anafiah, 2025). The material presented can include elements of local culture that are close to students' daily lives, making the learning process more contextual and meaningful. Thus, students not only learn to read, but also gain learning experiences that strengthen cultural identity and enhance a sense of ownership of the material being studied. The results of the literature review indicate the existence of a research gap that still needs to be studied further. First, the research (Onowugbeda, et al., 2025) Regarding puzzle media, it focuses on the educational game aspect and the improvement of learning outcomes in general, without integrating the cultural context of the students into the learning media design. In fact, the success of learning is not only determined by cognitive aspects but also by the teacher's ability and the learning media to connect the material with students' social and cultural experiences. Second, research (Wallace, et al., 2022) Regarding culturally responsive teaching, it is more focused on learning strategies, learning models, or curriculum development that accommodates the cultural diversity of students. This approach emphasizes the importance of making students' culture a learning resource that can enhance engagement, motivation, and academic success. However, research that integrates the principles of culturally responsive teaching into the development of puzzle media to improve reading skills is still very limited. In other words, there is a gap between studies on puzzle-based learning media and studies on culturally responsive teaching.

Third, research by (Mardalena, Nasrullah, & Faridawati, 2025) Stating that the developed reading learning media still use general materials and do not adequately represent the students' local culture. As a result, students often experience difficulties in connecting the content of the reading with the real experiences they have. The learning process will be more effective when new knowledge is related to the social and cultural environment that is already familiar to the students. Therefore, learning media that can provide a contextual reading experience through the integration of local cultural elements is needed. This study offers novelty in the development of puzzle media based on culturally responsive learning to improve the reading skills of elementary school students.

Unlike previous research, the developed puzzle media not only serves as an educational game tool but also integrates elements of local culture that are close to students' lives, such as regional languages, traditions, folk tales, and the local social environment. In addition to supporting the improvement of reading skills, this media also plays a role in introducing and preserving local culture. Another novelty lies in the integration of three aspects simultaneously, namely puzzle media, culturally responsive learning, and the reading skills of elementary school students, which is still rarely studied together. Thus, this research produces learning media that is innovative, contextual, and relevant to the literacy needs and the strengthening of cultural identity of students at SD Negeri 100309 Sibio-Bio.

## 2. METHODS

This research uses the Research and Development (R&D) method with the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation). The Research and Development method is a research method used to produce a specific product while also testing the feasibility and effectiveness of the product before it is widely used (Sugiyono, 2024). The ADDIE model is chosen because it has systematic, logical, and comprehensive stages in the process of developing learning products. According to (Branch, 2009), The ADDIE model provides an effective framework for designing, developing, and evaluating learning devices through five main interconnected stages. This research was conducted at SD Negeri 100309 Sibio-bio, East Angkola District, South Tapanuli Regency. The research object was puzzle media based on Culturally Responsive Teaching (CRT), while the research subjects consisted of 18 first-grade elementary school students. Data collection was carried out through tests, questionnaires, interviews, and documentation. The use of various data collection techniques aimed to obtain comprehensive information regarding learning needs, the process of media development, and users' responses to the developed product. The media development procedure follows the five stages of the ADDIE model. The first stage, Analysis, is carried out to identify learning needs, student characteristics, reading learning conditions, as well as problems faced by students in reading skills. The second stage, Design, includes designing puzzle media based on Culturally Responsive Teaching, preparing materials, media display design, and preparing research instruments. The third stage, Development, is carried out by developing the product according to the design that has been made and then validated by media experts and material experts to obtain input regarding the quality of the product. The fourth stage, Implementation, is carried out by trialing the media with first-grade students at SD Negeri 100309 Sibio-bio to determine the practicality and effectiveness of its use in learning. The final stage, Evaluation, is carried out to assess the overall process and development results based on validator suggestions, user responses, and product trials in order to obtain a product that is suitable for use in learning (Branch, 2009).

The data analysis in this study uses descriptive qualitative and descriptive quantitative techniques based on percentages. Qualitative data obtained through interviews, comments, suggestions, and input from validators are analyzed descriptively to illustrate the strengths, weaknesses, and recommendations for product improvement. Meanwhile, quantitative data obtained from validation sheets, teacher and student response questionnaires, and test results are analyzed using percentages to determine the feasibility, practicality, and effectiveness of the media. The analysis in this study does not use inferential statistical tests or significance tests, but rather focuses on interpreting the results based on predetermined percentage categories (Arikunto, 2021). Media feasibility testing was conducted through validation by media experts and material experts using a five-point Likert scale, namely score 5 (very feasible), score 4 (feasible), score 3 (fairly

feasible), score 2 (less feasible), and score 1 (not feasible). The validity percentage was calculated using the following formula:

$$\text{Validity Percentage} = \frac{\text{Obtained Score}}{\text{Maximum Score}} \times 100\%$$

The criteria for validity interpretation refer to (Akbar, 2017), namely 81–100% (very valid), 61–80% (valid), 41–60% (quite valid), 21–40% (less valid), and 0–20% (not valid).

The practicality test was conducted through teacher and student response questionnaires using a five-point Likert scale. The percentage of practicality was calculated using the formula:

$$\text{Practicality Percentage} = \frac{\text{Score Obtained}}{\text{Maximum Score}} \times 100\%$$

The calculation results are interpreted into categories of 81–100% (very practical), 61–80% (practical), 41–60% (quite practical), 21–40% (less practical), and 0–20% (not practical) (Riduwan, 2018). The effectiveness of the media is evaluated through the results of students' reading skills pretest and posttest using Normalized Gain (N-Gain) analysis developed by (Hake, 1999). This analysis is used to determine the level of improvement in learning outcomes after the use of puzzle media based on Culturally Responsive Teaching. The N-Gain formula is as follows:

$$g = \frac{\text{Posttest Score} - \text{Pretest Score}}{100 - \text{Pretest Score}}$$

According to (Hake, 1999), the N-Gain values are interpreted into three categories, namely  $g < 0.30$  (low),  $0.30 \leq g \leq 0.70$  (medium), and  $g > 0.70$  (high). In addition, the effectiveness level of the media can be determined based on the N-Gain percentage with categories  $<40\%$  (ineffective),  $40\text{--}55\%$  (less effective),  $56\text{--}75\%$  (fairly effective), and  $>76\%$  (effective). The results of this analysis are used to describe the improvement of students' reading skills after using culturally responsive teaching-based puzzle media that was developed.

### 3. RESULTS AND DISCUSSION

#### Results

Based on the research and development results of Puzzle media based on Culturally Responsive Teaching (CRT) to improve the reading skills of first-grade students at SD Negeri 100309 Sibio-Bio, several main findings were obtained as follows:

#### Product Validity

The validity test results showed that the puzzle media based on Culturally Responsive Teaching (CRT) that was developed has met the eligibility criteria as a learning media. The assessment was carried out by three validators, namely a media expert, a material expert, and a language expert. In detail, the validation results showed that the media expert validation obtained a score of 77.3%, which falls into the valid category. Furthermore, the material expert validation achieved a score of 80%, categorized as valid, while the language expert validation also obtained a score of 80%, indicating a valid category. These findings indicate that the developed puzzle media has met the feasibility requirements in terms of media design, content appropriateness, and language accuracy. Therefore, the media is considered suitable for use in the reading learning process at the elementary school level.

**Table 1. Validity Results of the CRT-Based Puzzle Media**

No.	Validator	Percentage (%)	Category
1	Media Expert	77.3%	Valid
2	Material Expert	80%	Valid
3	Language Expert	80%	Valid

### Product Practicality

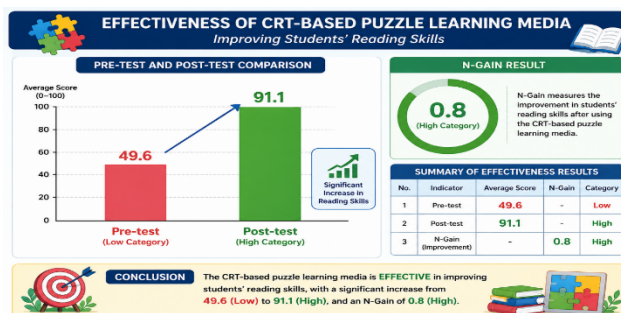
The practicality test results based on user responses revealed that the developed puzzle media demonstrated a very high level of practicality. The assessment was conducted through responses from teachers and students as the primary users in the learning process. Based on the analysis, teachers' responses to the use of the media obtained a score of 86.2%, which falls into the very practical category. Meanwhile, students' responses yielded a slightly higher score of 86.5%, also categorized as very practical. These findings suggest that the developed puzzle media is not only easy for teachers to use during the learning process but is also capable of attracting students' interest and promoting their active engagement in learning activities. Therefore, this media is considered suitable for the needs of lower-grade elementary classrooms and has the potential for wider implementation in educational settings.

**Table 2. Practicality Results of the Media Based on User Responses**

No.	Respondent	Practicality Score (%)	Category
1	Teacher	86.2%	Very Practical
2	Students	86.5%	Very Practical

### Product Effectiveness

The effectiveness of the Culturally Responsive Teaching (CRT)-based puzzle media was measured by comparing students' reading skill scores before and after the implementation of the media through pre-test and post-test assessments. The analysis results revealed a significant improvement following the use of the media in the learning process. Initially, the students' average pre-test score was 49.6, which falls into the low category, indicating that their reading skills prior to the intervention were still below the expected level. After the implementation of the CRT-based puzzle media, a substantial increase was observed in the post-test results, with an average score of 91.1, categorized as high. Furthermore, the N-Gain analysis yielded a score of 0.8, which is classified as a high gain category. This result indicates that the improvement in students' reading skills was pedagogically effective after the use of the developed learning media. Therefore, it can be concluded that the CRT-based puzzle media is effective in enhancing students' reading skills, as evidenced by the significant improvement in learning outcomes between the pre-test and post-test scores. The development outcomes and effectiveness results are illustrated in the following figure.



**Figure 1. Product Effectiveness**

### ADDIE Development Process

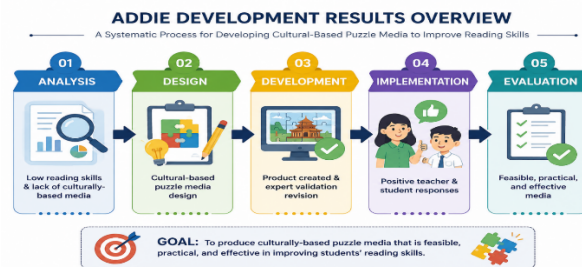
The development of the Culturally Responsive Teaching (CRT)-based puzzle media was carried out using the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. Each stage generated findings that collectively contributed to the production of a learning media that is suitable for classroom use. During the Analysis stage, it was found that students' reading skills were relatively low and that the use of culturally based learning media in the classroom was still limited. These findings served as an important foundation for

developing a more contextual learning media that aligns with students' needs and backgrounds. In the Design stage, a puzzle media concept was created by integrating local cultural elements as part of a culturally responsive learning approach. In the Development stage, the designed media was transformed into an actual product and subsequently revised based on expert validation results to ensure the appropriateness of the content, media design, and language aspects. During the Implementation stage, the revised media was tested in the classroom and received positive responses from both teachers and students, particularly regarding its ease of use and its ability to enhance student engagement in learning activities. Finally, in the Evaluation stage, the overall results demonstrated that the CRT-based puzzle media was feasible, practical, and effective for use in reading instruction in lower elementary grades.

**Table 3. Results of Media Development Using the ADDIE Model**

ADDIE Stage	Main Findings
Analysis	Students' reading skills were low, and culturally based learning media were limited.
Design	A puzzle media integrating local cultural elements was successfully designed.
Development	The product was revised based on expert validation results.
Implementation	Teachers and students provided positive responses to the media.
Evaluation	The media was found to be feasible, practical, and effective.

In developing the Culturally Responsive Teaching (CRT)-based learning media, this study employed the ADDIE development model, which consists of five main stages: Analysis, Design, Development, Implementation, and Evaluation. This model was selected because it is systematic, structured, and easily adaptable to the development of learning media in elementary schools. Each stage of the ADDIE model plays a crucial role in ensuring that the resulting product is not only theoretically valid but also practical and effective in improving students' reading skills. The development process is illustrated in the following figure.



**Figure 2. Flowchart of ADDIE Model in Developing Culturally Responsive Teaching (CRT)-Based Puzzle Learning Media**

Based on the ADDIE diagram, it can be seen that the development process of CRT-based puzzle media began with the analysis stage, which identified students' low reading skills and the lack of culture-based learning media. Next, in the design stage, the puzzle media was designed to integrate local cultural elements as the learning context. In the development stage, the designed product was then realized and validated by experts, and revised according to the feedback provided. The implementation stage showed a positive response from teachers and students regarding the use of the developed learning media. Finally, in the evaluation stage, the media was deemed feasible, practical, and effective for improving primary school students' reading skills.

**Discussion**

The results of research and development of Puzzle media based on Culturally Responsive Teaching (CRT) indicate that the integration of local cultural elements in reading instruction for

first-grade elementary school students has a significant impact on the quality of both the learning process and outcomes. These findings cannot be separated from various theoretical studies and previous research results that emphasize the importance of learning that is contextual, meaningful, and aligned with the cultural background of students. In general, the validity of the media, which falls into the feasible category according to media, material, and language experts, indicates that the developed product has met good pedagogical and didactic standards. This is in line with the view (Murniningsih, Widyawati, Alkhasni, & Praditya, 2025) which emphasizes that good learning media must meet aspects of content accuracy, design suitability, and language readability in order to effectively support the achievement of learning objectives. The CRT concept proposed by (Walker & Hutchison, 2021; Acosta & Duggins, 2021) emphasizing that effective learning must accommodate students' cultural experiences as part of the knowledge construction process, so that the material presented is not foreign, but close to the students' daily lives. Thus, the validity of this puzzle media shows that integrating local culture into learning design is not only theoretically relevant, but can also be implemented practically in the form of concrete and interactive media. Furthermore, the high level of practicality of the media based on teacher and student responses indicates that CRT-based puzzle media is not only theoretically feasible, but also easy to use in real classroom contexts. The aspect of practicality in the development of educational products is determined by the extent to which the product can be used effectively by users in actual learning conditions without experiencing significant difficulties (Hammond, 2021; Fitriani, Yahya, & Setyaningrum, 2025). In this study, the high practicality scores from teachers and students indicate that puzzle media is able to create an enjoyable, interactive learning experience and encourage active student engagement. This is also reinforced by (Wahyuningsih & Maretha, 2024) which states that game-based learning media has great potential in increasing student motivation and participation, especially at the elementary school level, which is still at the concrete operational stage as explained by Piaget. At this stage, students find it easier to understand abstract concepts when presented in a concrete and manipulative form, such as puzzles that can be touched, arranged, and played. In line with this, Bruner, through the enactive representation theory, also emphasizes that learning experiences involving physical activities will strengthen the understanding of concepts more deeply.

In terms of effectiveness, the significant increase in learning outcomes from an average pre-test score of 49.6 to 91.1 in the post-test, with an N-Gain value of 0.8, shows that CRT-based puzzle media has a strong influence on improving students' reading skills. This finding reinforces the results of the research (Tanase, 2020; Sitorus, Sipahutar, Nasution, Purnama, & Iskandar, 2025) which states that learning packaged in a contextual and meaningful way can improve literacy skills because students find it easier to understand texts that are connected to their life experiences. In addition, Vygotsky in his sociocultural theory emphasizes that learning occurs optimally when students interact with a familiar social and cultural environment, so CRT-based media that integrate local culture becomes very relevant in improving early reading skills. Research (Asmaryadi, Hader, & Sartika, 2025) It also shows that a culture-based learning approach can improve learning outcomes because students feel that their cultural identity is more valued, thereby increasing emotional and cognitive engagement in the learning process. The high improvement in learning outcomes in this study also indicates that puzzle media not only functions as a visual aid but also as a means of cognitive stimulation that helps students recognize letters, words, and text meanings more effectively. Viewed from the development process using the ADDIE model, the success of this media is also inseparable from the systematic stages starting from needs analysis to product evaluation. The analysis stage is the main foundation in the development of learning media because it determines the design direction that suits the needs of the learners (Yuninda, Rusminto, Pramudiyanti, & Adha, 2024). In this study, it was found that students' reading ability is still low

and there is a lack of culture-based learning media, which becomes an important basis for the development of more contextual media. At the design stage, the integration of local cultural elements into the puzzle reflects the practical implementation of CRT, which emphasizes the importance of cultural relevance in learning. Next, in the development stage, revisions based on expert validation indicate a product refinement process that aligns with the principles of systematic educational media development. The implementation stage shows positive responses from teachers and students, which reinforces the findings (Arini, Rosmilawati, & Hendrayana, 2025) that active learning based on interactive media can significantly increase student engagement and understanding. Finally, at the evaluation stage, the media is deemed feasible, practical, and effective, which indicates that the entire development process has been carried out in accordance with good R&D principles. Overall, the findings of this study reinforce various theoretical and empirical studies that culturally-based learning combined with concrete media such as puzzles has great potential in improving the reading skills of elementary school students. The integration of CRT, educational game media, and a constructivist approach provides a learning experience that not only enhances students' cognitive aspects but also their affective and social aspects. Thus, CRT-based puzzle media not only serves as a learning innovation but also as an important contribution to the development of early literacy learning that is more inclusive, contextual, and meaningful according to the needs of students in the 21st-century education era.

#### 4. CONCLUSION

Overall, the research and development of Puzzle media based on Culturally Responsive Teaching (CRT) shows that the resulting product is feasible to be used in reading lessons in Grade 1 at SD Negeri 100309 Sibio-Bio as it meets the aspects of validity, practicality, and effectiveness. Based on expert validation results, the media received a valid category with a score of 77.3% from media experts and 80% from material and language experts, indicating that the media is appropriate in terms of design, content, and language. From the practicality aspect, teacher (86.2%) and student (86.5%) responses were in the very practical category, indicating that the media is easy to use, engaging, and capable of increasing active student involvement in learning. Meanwhile, in terms of effectiveness, there was a significant improvement in learning outcomes from an average pre-test score of 49.6 to a post-test score of 91.1 with an N-Gain of 0.8 (high category), which indicates that the media is pedagogically effective in improving students' reading skills. These findings imply that the integration of CRT in game-based learning media such as puzzles can strengthen contextual, meaningful learning that aligns with students' cultural backgrounds, while also supporting constructivist theory and the sociocultural approach that emphasize the importance of learning experiences close to students' lives. However, this study has limitations in terms of the small sample size, the still simple scope of the material, and it has not examined long-term impacts and the influence of students' external factors in depth. Therefore, future research is recommended to expand the sample, develop media on more complex reading skills, test long-term effectiveness, as well as compare it with other learning media or integrate it with digital technology to be more relevant to the development of 21st-century learning.

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