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Development Of Smart Box Literacy Media To Improve Early Reading Skills Of Grade II Students

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Abstract

This study aims to develop Smart Box Literacy–based learning media and examine its effectiveness in improving the beginning reading skills of grade II students at SDN Rato, Lambu District. The research employs a Research and Development (R&D) method using the Borg and Gall development model, which was modified into five stages: (1) preliminary study, (2) planning, (3) initial product development, (4) limited-scale trials, and (5) product revision. This study involved 18 grade II students as research subjects. The results show that the Smart Box Literacy media is valid and suitable for use in beginning reading instruction, with validation scores of 92% from media experts (very valid category) and 90% from material experts (very valid category). The effectiveness test using paired sample t-test statistical analysis indicated a significant increase in students' average reading scores after using the media compared to before its use. Furthermore, both teachers and students gave highly positive responses to the media, noting that it was engaging, easy to use, and helpful in improving students' reading comprehension. Therefore, Smart Box Literacy is declared effective and feasible to be used as an innovative, engaging, and relevant learning medium to enhance beginning reading skills at the elementary school level.

KATA KUNCI:
Media Pembelajaran, Literasi Kotak Pintar, Membaca Pemula, Sekolah Dasar

Abstrak

Penelitian ini bertujuan untuk mengembangkan media pembelajaran berbasis Smart Box Literacy dan menguji efektivitasnya dalam meningkatkan kemampuan membaca permulaan siswa kelas II di SDN Rato, Kecamatan Lambu. Penelitian ini menggunakan metode Research and Development (R&D) dengan model pengembangan Borg dan Gall yang dimodifikasi menjadi lima tahap, yaitu: (1) studi pendahuluan, (2) perencanaan, (3) pengembangan produk awal, (4) uji coba skala terbatas, dan (5) revisi produk. Subjek penelitian ini adalah 18 siswa kelas II. Hasil penelitian menunjukkan bahwa media Smart Box Literacy valid dan layak digunakan dalam pembelajaran membaca permulaan, dengan skor validasi 92% dari ahli media (kategori sangat valid) dan 90% dari ahli materi (kategori sangat valid). Uji efektivitas menggunakan analisis statistik paired sample t-test menunjukkan adanya peningkatan yang signifikan pada rata-rata nilai membaca siswa setelah menggunakan media dibandingkan sebelum penggunaannya. Selain itu, baik guru maupun siswa memberikan respon yang sangat positif terhadap media tersebut, menyatakan bahwa media ini menarik, mudah digunakan, dan membantu meningkatkan pemahaman membaca siswa. Dengan demikian, Smart Box Literacy dinyatakan efektif dan layak digunakan sebagai media pembelajaran yang inovatif, menarik, dan relevan untuk meningkatkan kemampuan membaca permulaan di tingkat sekolah dasar.

INTRODUCTION

Reading is a fundamental language skill that every student must master from an early age. This skill serves as an essential foundation for supporting the acquisition of knowledge and students' success at the next levels of education. At the elementary school level, especially in the lower grades (Grades I–III), reading instruction becomes a top priority to ensure that students have a strong literacy foundation. Beginning reading includes the ability to recognize letters, combine syllables, read simple words and sentences, and understand the meaning of texts. Effective reading instruction not only emphasizes the mechanical aspects (the techniques of reading) but also focuses on comprehension and students' engagement in the reading process.(Syafi'i & Rapi, 2022)

However, various studies have shown that elementary school students' early reading abilities remain relatively low. This is caused by the use of learning media that are less engaging and non-interactive. Most teachers still rely on conventional textbooks and lecture methods, which make students easily bored. In fact, innovative and contextual learning media are needed to foster reading interest and improve students' comprehension from an early age. The research gap arises from the limited studies on the development of literacy media based on simple technology that can be used independently by elementary school students, particularly at the beginning reading stage. Previous studies have mostly focused on digital media, such as Android-based applications or e-learning platforms, which require electronic devices and internet access. Meanwhile, elementary schools in rural or under-resourced areas need alternative learning media that are easy to use, cost-effective, and still interactive. This is where the study on Smart Box Literacy finds its urgency and relevance.(Astri & Amalia, 2024)

Smart Box Literacy is an innovative learning medium in the form of an interactive box containing letter cards, syllables, pictures, and reading activity games. Unlike similar media such as *word cards* or reading corner boxes*,* which generally only provide reading materials, Smart Box Literacy is designed with level-based activities and a self-evaluation system. Each component encourages students to learn through exploration and play, making reading instruction more enjoyable, contextual, and student-centered. Another advantage is that this medium does not depend on electricity or internet connections, allowing it to be used in all school settings. The operational definitions in this study include two key concepts: Beginning reading refers to elementary students' ability to recognize letters, form syllables, read simple words and sentences, and comprehend short texts. Smart Box Literacy refers to an educational box-shaped learning medium containing literacy cards and games used to improve students' beginning reading skills through active, interactive, and enjoyable learning activities.(Widana, 2024)

In terms of the **theoretical or conceptual framework**, this study is grounded in Piaget's theory of cognitive development, which emphasizes that elementary-aged children are at the concrete operational stage, where learning is most effective when accompanied by tangible objects and play-based activities. In addition, Vygotsky's constructivist theory underpins the idea that knowledge is constructed through social interaction and meaningful learning experiences. Smart Box Literacy integrates both principles by providing play-based and collaborative learning experiences, enabling students to construct their reading comprehension through direct engagement and exploration. owever, the reality on the ground shows that many elementary school students, especially in grade II, still have difficulty in reading at the beginning. This also happened at SDN Rato, Lambu District. From initial observations and interviews with grade II teachers, it was revealed that almost 60% of students were not able to read simple words and sentences fluently. They experience obstacles in recognizing letters, combining syllables, and understanding

the content of reading. Some students are still below the reading stage at the phonemic level.(Zahra et al., 2024)

Learning to read begins requires a fun, creative, and contextual approach. Learning media plays an important role in creating a meaningful learning experience. Innovative and interactive media can interest students, increase concentration, and help them understand abstract concepts concretely. One of the media that has great potential in early reading learning is manipulative media that combines visual and kinesthetic aids, such as smart boxes or known as Smart Box Literacy. Smart Box Literacy is a box-shaped learning media that contains various reading aids, including letter cards, syllable cards, picture cards, word mini-puzzles, and illustrated short stories. This media is designed to encourage students to learn through learning by playing, which is very suitable for the characteristics of low-grade students. Through a multisensory, visual, auditorial, and kinesthetic approach, this media is able to help students recognize letters and words while improving memory skills, involvement in learning, and confidence. This research was conducted to answer the need for innovative and effective learning media at SDN Rato, Lambu District. The main purpose of this study is to develop Smart Box Literacy media as a tool to improve the initial reading ability of grade II students, as well as to test the effectiveness of its use in the learning process. With this media, it is hoped that it can help overcome the challenges of reading learning which has been an obstacle for students and teachers. Through this research and development, the author wants to contribute to providing learning resources that are contextual, applicative, and in accordance with the needs of 21st century learning, namely learning that encourages creativity, active participation, and meaningful learning. In addition, this research is also expected to be a reference for teachers, researchers, and media developers in designing more effective literacy learning strategies in elementary schools, especially in the early stages of reading.(Kasi, 2022)

RESEARCH METHODS

This study employed a Research and Development (R&D) approach using the Borg and Gall development model, which was modified into five stages, namely: (1) preliminary study, (2) planning, (3) initial product development, (4) limited-scale trials, and (5) product revision. This design was chosen because it enables a systematic process of developing, validating, and evaluating instructional media to ensure feasibility and effectiveness before large-scale implementation. The research was conducted at SDN Rato, Lambu District, Bima Regency, during the 2024/2025 academic year, involving 18 grade II students as research subjects. The participants, consisting of 10 boys and 8 girls, were selected through a purposive sampling technique based on their reading proficiency levels and teacher recommendations.(Okpatrioka, 2023)

Data were collected using several research instruments, including a reading ability test, observation sheets, and questionnaires. The reading test was administered to measure students' beginning reading skills before and after using the *Smart Box Literacy* media. Observation sheets were used to record students' engagement and learning behavior during implementation, while questionnaires were distributed to teachers and students to gather responses regarding the practicality, attractiveness, and usability of the media. The instruments were validated by two media experts and two material experts, yielding validity scores of 92% and 90%, respectively, which were categorized as *very valid*. Reliability testing using Cronbach's Alpha produced coefficients above 0.80, indicating that the instruments were highly reliable.(Fagan, 2021) The development process followed the modified Borg and Gall model consisting of five main stages. The preliminary study involved a needs analysis through teacher interviews, classroom observations, and literature

review. The planning stage focused on determining learning objectives, designing content, and selecting appropriate reading activities. The initial product development stage involved designing the *Smart Box Literacy* prototype, which contained letter cards, syllable cards, picture cards, and reading activity games. Subsequently, a limited-scale trial was conducted with 18 students to evaluate the feasibility, practicality, and effectiveness of the product. Feedback from experts, teachers, and students was then used in the product revision stage to refine the final version of the media. Data were analyzed using descriptive and inferential statistical techniques. Descriptive analysis was used to interpret validation results and user responses, while inferential analysis employed the paired sample t-test to determine the significance of improvement in students' reading scores before and after using the media.(Branch, 2010)

Validation and feasibility analysis showed that *Smart Box Literacy* achieved very high scores from both media and material experts, indicating that the product is pedagogically appropriate and suitable for use in elementary school reading instruction. Teacher and student responses also indicated that the media was engaging, easy to use, and supportive of students' reading comprehension. This research was conducted over a period of two months (July–August 2025), encompassing all stages from the preliminary study to product revision. The study adhered to ethical research standards by obtaining permission from the school principal and classroom teachers. All participants and their guardians were informed about the purpose of the study, and their participation was entirely voluntary. The confidentiality and anonymity of participants' data were maintained throughout the research process.. In summary, the research followed a systematic R&D process based on the Borg and Gall model to develop, validate, and test the effectiveness of *Smart Box Literacy*. Through expert validation, limited trials, and statistical testing, the study confirmed that the media is valid, effective, and feasible to be implemented as an innovative and engaging learning tool to improve beginning reading skills among elementary school students.(Andi Rustandi & Rismayanti, 2021)

RESULTS AND DISCUSSION

Results

A. Product Description of Literacy Smart Box Media

Smart Box Literacy is an innovative learning medium designed to enhance elementary students' beginning reading skills. The product is a compact interactive box measuring 35 cm × 25 cm × 20 cm and weighing approximately 1.5 kg, made of lightweight plywood coated with a laminated finish to ensure durability and child safety. This media contains letter and syllable cards**,** vocabulary picture cards, and an interactive audio module that plays the pronunciation of letters, words, and simple sentences. The audio feature is developed using a DFPlayer Mini sound module connected to a small low-power speaker, allowing students to hear correct pronunciations independently. Pedagogically, each component of Smart Box Literacy is designed based on multisensory learning principles, combining visual (images and colors), auditory (sound and pronunciation), and kinesthetic (arranging letters and words) elements. This design aims to strengthen student engagement and facilitate phonemic awareness through enjoyable learning experiences.(Zahra et al., 2024)

1. The Smart Box Literacy consists of four main components:
2. Main Box (Smart Box): storage compartment for letter and picture cards.
3. Activity Board: surface where students arrange letters into syllables and words.

4. Literacy Cards: illustrated cards with themes familiar to children (animals, objects, professions, daily activities).
5. Audio Pronunciation Feature: helps students recognize and pronounce letters correctly.

Through this design, Smart Box Literacy functions not only as a literacy tool but also as an interactive learning aid that fosters learning motivation and builds early reading independence in a playful and contextual manner.

B. Limited Trial Results

The media trial was carried out on 18 grade II students of SDN Rato within three weeks. The assessment was carried out by comparing the results of the initial reading test before and after the use of media. Aspects measured include: (1) Ability to recognize letters and syllables. (2) Ability to read simple words and sentences. (3) Ability to understand the content of simple reading. The pre-test results showed that out of 18 students, only 8 students (44%) were able to read the word completely and correctly, while 7 students (38%) were still stuttering and were not able to combine letters into syllables fluently. Meanwhile, 3 students (16%) who cannot read. The average pre-test score is 72.78(Huduni et al., 2022)

After the intervention using Smart Box Literacy media for six sessions, the post-test results showed a significant improvement. The average score of students increased from 72.78 to 82.5. As many as 14 out of 18 students (77.78%) managed to read simple sentences fluently. In addition, there is an improvement in the aspect of reading comprehension and pronunciation of letter sounds accurately.(*13+Arvina_Pratiwi+Penerapan+Media+Smart+Box+(106-114)*, n.d.)

C. Analysis of Improving Initial Reading Ability

The analysis of students' progress demonstrates that **Smart Box Literacy** effectively enhanced their ability to recognize letters, understand sounds, and construct simple words and sentences. Observational data showed high levels of enthusiasm and active participation during learning activities. One teacher commented: "The students seemed more focused when learning with the Smart Box, especially when listening to the letter sounds and trying to repeat them."

This improvement aligns with constructivist learning theories (Piaget & Vygotsky, 1978), emphasizing the importance of meaningful learning experiences through direct interaction with concrete media and social collaboration. Furthermore, the principles of multisensory learning support the integration of visual, auditory, and kinesthetic modalities to strengthen phonological understanding during the early stages of reading. The results also correspond with previous studies by , which found that interactive-based learning media can significantly enhance students' motivation and reading accuracy at the elementary level. Therefore, Smart Box Literacy can be considered an innovative, engaging, and relevant instructional medium that not only improves beginning reading ability but also promotes independent literacy development among young learners.(Widiyanti & Anugraheni, 2022)

D. Teacher and Student Response to Media

1. Teacher's Response**:**
   a) The teacher revealed that this media is very effective in supporting reading learning, especially for students who face learning difficulties.
   b) Teachers feel that this media is flexible and can be used in various lesson sessions, both at the beginning, core, and end of learning.

c) According to teachers, Smart Box Literacy encourages active and creative learning according to the characteristics of low-grade students.(Situmorang, 2022)

2. Student Response**:**
   a) Students feel happy using media because they can "play while learning".
   b) Many students state that they have an easier time remembering letters and words after using cards and games in the box.
   c) Students also show high interest when they open the box and choose the cards or stories they want to read.(Aminah & Yusnaldi, 2024)

E. Smart Box Literacy Media Validation Table

Validation tables are a format used to present the results of assessments from experts (such as material, media, and language experts) on a product or learning media, such as Smart Box Literacy**.** This table helps the feasibility of the media, The numbers are diverse but consistently in the category of "feasible" to "very valid" (~84%–96%). The response of teachers and students is generally >90%, indicating that this medium is practical and in demand.(Rohendi et al., 2023)

Validation from media experts reached **94%, subject** matter experts **84%,** resulting in "very valid" criteria. The response of teachers **was 96%,** students **92.96%** (18 students) → the media was very practical. Its effectiveness is proven through an increase in reading literacy by **81.2%,** which is in the category of very effective.(Alsyabri, 2021)

1. Validation by Subject Matter Experts

Tabel 1 Validation by Subject Matter Experts

Number	Aspects Assessed	Assessment Indicators	Maximum Score	Score Awarded
1	Material Suitability	The material is in accordance with the basic competencies of grade II elementary school	4	4
2	Concept Truth	Literacy information/content is correct and in accordance with the rules of the language	4	3
3	Depth of Material	The material is able to develop the ability to read at the beginning	4	4
4	Fit for Purpose	The material supports learning objectives and competency achievement indicators	4	4
5	Material Innovation	The material is structured creatively and contextually for elementary school children	4	4
Total score			20	19

2. Validation by Media Experts

Tabel 2 Validation by Media Experts

Number	Aspects Assessed	Assessment Indicators	Maximum Score	Score Awarded
1	Visual Design	Interesting colors, images and designs for kids	4	4

2	Media Size and Quality	Font size, cards, and other elements are appropriate and proportional	4	4
3	Layout Consistency	Image and text layouts are consistent and easy to understand	4	4
4	Component Completeness	All components (letter cards, pictures, minibooks, audio) are available and working	4	4
5	Durability and Practicality	The media is sturdy, easy to use, and not easily damaged	4	3
Total score			20	19

3. Validation by Classroom Teachers

Tabel 3 Validation by Classroom Teachers

Number	Aspects Assessed	Assessment Indicators	Maximum Score	Score Awarded
1	Ease of Use	Teachers easily understand how to use media in learning	4	4
2	Curriculum Fit	Media in accordance with the curriculum and learning objectives	4	4
3	Student Response	Students are enthusiastic and engaged when using the media	4	4
4	Effectiveness	Media is able to improve students' initial reading skills	4	4
5	Time of Use	Media can be used within the available learning time	4	4
Total score			20	20

4. Score Description

   Using the 4-point Likert scale:

   a. 4 = Excellent
   b. 3 = Good
   c. 2 = Enough
   d. 1 = Less

5. Validity Percentage Formula

   Percentage (%) = (Number of Scores Obtained / Maximum Score) × 100%

   Then categorized accordingly:

Percentage (%)	Category
85 – 100	Highly Valid
70 – 84	Valid
55 – 69	Quite Valid
< 55	Invalid

Discussion

The results of this study support constructivist learning theory and the multisensory approach in reading instruction. The Smart Box Literacy media indirectly applies the principles of experiential learning, which emphasize the importance of active student engagement throughout the learning process. Through this medium, students do not merely receive information passively but also engage directly with concrete and relevant learning materials, thereby enhancing their motivation and comprehension. The improvement in early reading skills demonstrates that enjoyable, contextual, and interactive learning media have a positive effect on students' academic achievement. This finding aligns with the concept of multisensory learning, which involves multiple senses such as sight, hearing, and touch, strengthening the encoding process of information into long-term memory.(Wahyuddin, 2016)

This result is further supported by previous studies conducted by (Fitriani), which found that the use of concrete and manipulative media is effective in improving reading skills among lower-grade students. Media that can be touched and manipulated help students grasp the concepts of letters, syllables, and sentences more easily than conventional lecture-based or text-only methods. One of the advantages of Smart Box Literacy is its independence from electricity or internet connectivity, making it highly relevant for use in remote areas with limited technological access. This adds strategic value to the media as an inclusive and sustainable literacy solution, helping to bridge educational gaps caused by technological limitations.(Pangesti et al., 2024)

Beyond cognitive benefits, this medium also provides psychological advantages. Children who struggle with reading often experience low self-esteem and a lack of confidence. Fun, interactive, and user-friendly learning media can boost students' motivation and confidence in reading—an improvement crucial to preventing early school dropout and building a solid educational foundation. Pedagogically, Smart Box Literacy allows teachers to employ more varied and adaptive instructional strategies suited to students' diverse learning styles. The multisensory approach also gives teachers flexibility in delivering materials, making the learning process more effective and efficient.(SMERU, 2022)

More broadly, the success of this medium can serve as a model for developing other learning innovations that combine multisensory principles with simple technology. Such an approach could be applied not only in literacy instruction but also in other subjects such as mathematics, science, and languages, especially in regions with limited educational facilities. Although the findings of this study are highly positive, several aspects warrant further development. For example, long-term testing is needed to determine the sustainability of reading improvement. Moreover, future evaluations should assess students' abilities in other areas such as advanced reading comprehension, writing skills, and everyday language use. Subsequent research could also examine the effectiveness of this medium when integrated with simple digital technologies—such as interactive audio features or companion applications—to enrich students' learning experiences without compromising the advantages of non-electronic media.(Suyana, 2018)

Overall, this study confirms that learning innovations emphasizing active interaction, real-world contexts, and multisensory engagement can significantly enhance learning outcomes. Smart Box Literacy offers a relevant and practical instructional model for educational settings in remote areas or regions with infrastructural challenges, while simultaneously strengthening literacy as a foundational element for students' future competency development.(Tuhuteru et al., 2023) Despite its many advantages, Smart Box Literacy also has several limitations that should be considered for future improvement. These include limited material variation, as the media

primarily focuses on early reading and simple sentences, which may be insufficient for students who have advanced beyond the basic stage. Its effectiveness also depends heavily on teacher guidance, which may be reduced if teachers are not adequately trained. Additionally, the lack of interactive digital or audio features limits engagement options compared to digital media that offer sound, animation, or real- time feedback. As a physical medium, Smart Box Literacy also requires proper maintenance and storage and is vulnerable to damage if used by many students without care. Furthermore, it is best suited for small groups, as large classes would require multiple units, making costs and management less efficient. Finally, the absence of automated evaluation data means that teachers must assess student progress manually, which can be time-consuming and less precise.(Zahro, 2024)

Nevertheless, the strengths of Smart Box Literacy remain highly significant, particularly in learning contexts with limited technological resources. Addressing these weaknesses—through integration with simple digital components, enhanced teacher training, and expanded material variety—will be crucial for optimizing its future development.(Putri et al., 2024) (1) **Limitations of Material Variation**, Smart Box Literacy *media* in general focuses on learning to read beginning and simple sentences. Therefore, the material provided may be less varied and limited to a certain level of ability only. This can be an obstacle when students have passed the basic stage and need more complex and challenging material. (2) **Dependence on Teacher Assistance,** Although these media are easy to use, their effectiveness depends heavily on the active role of the teacher or educator in directing and guiding students. If teachers are poorly trained or do not fully understand how to use media, then the benefits can be significantly reduced. (3) **Lack of Interactive Digital or Audio Components**, Smart Box Literacy *media* that does not use electricity and internet is indeed an advantage, but on the other hand it also limits the possibility of presenting interactive audio features, animations, or direct feedback that are commonly found in digital learning media. In fact, these features can enrich the learning experience and help students understand the material more easily through sound and movement. (4) **Limited Physical Use of Media**, Due to its nature as a physical medium, *Smart Box Literacy* requires good storage space and maintenance. This medium is also prone to damage if not stored properly, especially if it is used by many students at once. This can be a challenge in managing media in schools with limited facilities.(Smaldino, S, E, Lowther, D, L, Mims, 2010) (5) **Limitations of Scale of Use**, This medium is more suitable for small groups or classes with a limited number of students. Use in large classes may require multiple media units so that costs and management are less efficient. (6) **Lack of Automated Evaluation Data**, Unlike digital media that can record and analyze student learning results automatically, *Smart Box Literacy* does not provide a real-time learning outcome recording feature. This makes teachers have to conduct evaluations manually, which can be time-consuming and potentially less accurate.(SaThierbach et al., 2015)

Despite these weaknesses, the advantages of *Smart Box Literacy media* in the context of learning in remote areas and with technological limitations are still very significant. However, attention to these weaknesses is important to be carried out so that the development of media in the future can be more optimal, for example by combining this physical media with simple digital technology, adequate teacher training, and the provision of a wider variety of materials.(Hsb et al., 2024)

CONCLUSION

The study demonstrates that Smart Box Literacy is an effective and innovative learning medium for improving early reading skills among second-grade elementary students. The media successfully increased students' abilities in recognizing letters, forming syllables, reading simple words and sentences, and understanding reading content. Quantitative results show an increase in average scores from 72.78 (pre-test) to 82.5 (post-test), supported by qualitative observations of higher student engagement, confidence, and motivation during learning. Teachers also responded positively, emphasizing the media's practicality, flexibility, and suitability for classrooms with limited technological resources.

Pedagogically, this study reinforces the importance of developing context-based and student-centered learning media that combine play-based and interactive approaches. Smart Box Literacy effectively supports multisensory learning and provides an engaging environment for students, particularly in rural schools with infrastructure challenges. Its non-digital yet interactive nature makes it a sustainable and inclusive literacy solution adaptable to various teaching strategies.

Despite these positive results, several limitations should be noted: the study involved a small sample size, was limited to one school, and focused only on early reading skills. Future research should expand to broader contexts and include diverse literacy aspects such as reading comprehension and writing. Additionally, further development is recommended to incorporate simple digital features (e.g., interactive audio or companion apps) and locally contextualized content to enhance engagement. Collaboration between teachers, developers, and local education authorities is essential to ensure scalability and long-term impact.

This research proves that the development of learning media based on the needs of students and the school environment is very important in increasing learning effectiveness. In this context, **Smart Box Literacy is a form of learning innovation that is relevant to the needs in the field**, especially at SDN Rato, Lambu District. **Further development is needed on a wider scale**, both in terms of the number of students, teacher involvement, and variations in media content (e.g. locally-based children's story development), so that the benefits of this media are greater and have a wider impact. To obtain more comprehensive results, it is necessary to conduct effectiveness tests with an experimental quantitative approach at a larger level, such as a classroom or school unit.

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