

Development of Multisensory Reading Card Media Based on QR Video to Overcome Letter Reversal in Grade III Students with Indications of Dyslexia

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Abstract: Reading is a fundamental skill that is crucial for the academic success of elementary school students. One common obstacle experienced by third-grade students in Phase B at SDN Sumur Welut III is letter reversal, which is difficulty distinguishing between similar-looking letters like b–d and p–q. This is also often an early indicator in children with dyslexia. This obstacle not only disrupts reading fluency but also lowers students' self-confidence. This research aims to develop multisensory reading card media based on QR video as an innovative solution to help students overcome difficulties in reading similar letters related to dyslexia symptoms. The research method uses the Research and Development (R&D) model with a 4D approach, limited to the Develop stage, resulting in an initial prototype of the learning media. The developed media combines visual, auditory, and kinesthetic aspects thru the use of reading direction arrows, the selection of dyslexia-friendly fonts, and the integration of QR codes linked to word pronunciation videos. The development results show that this reading card has simple, practical, and adaptable characteristics for use both at school and at home. The novelty of this research lies in the integration of print media with simple technology, differing from previous studies that tended to focus solely on visual or fully digital aspects. Although it is still a prototype and has not been empirically tested, this medium has the potential to be an innovative alternative to support the improvement of basic literacy, particularly for students with reading difficulties, including indications of dyslexia. Further research is needed to test the validity, practicality, and effectiveness of the media in a broader learning context.

Keywords: Literacy, Dyslexia, Multisensory, Cards, QR

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INTRODUCTION

Education plays a strategic role in shaping the quality of a nation's human resources, because thru education a generation can be prepared to face increasingly complex global challenges (Suherman and Victorynie 2025). Education is not only focused on mastering knowledge, but also includes developing critical thinking patterns, positive attitudes, and 21st-century skills relevant to the needs of the times. In this case, teachers as learning agents play an important role in determining the success of education. This role goes beyond simply delivering material; it also involves creating learning strategies and media relevant to students' needs so they can learn effectively (Made, Sviri, and Arlinayanti 2024). Therefore, the availability of appropriate learning media is crucial in determining the quality of the learning process, especially for fundamental skills like reading.

Reading is a fundamental skill that serves as the primary foundation for the academic success of elementary school students (Pristiawati 2023). This ability serves as a gateway to understanding all fields of study, so learning success is highly dependent on the extent to which students master reading skills. However, the reality is that not all students are able to master reading skills at the same time. Differences in background, literacy experiences at home, and cognitive development rates are factors contributing to the diversity in students' reading abilities. A common obstacle is the difficulty in distinguishing letters with similar shapes, such as b and d, p and q, and vice versa (Syahroni, Rofiqoh, and Latipah 2021). These difficulties not only lead to technical errors in reading but also impact reading fluency and lower students' self-confidence in the classroom. Thus, reading is not merely the recognition of letters, but a complex process involving visual, perceptual, phonological, and cognitive aspects.

The phenomenon of difficulty reading similar letters is consistent with previous research findings on letter reversal. Letter reversal is understood as the condition where similarly shaped letters are switched, which is often found in children with reading difficulties or dyslexia (Peltier et al. 2022). (Islamy and Wachidah 2024) also emphasize that one common indicator of reading difficulty is the weak mapping between letter graphic symbols and their accompanying phoneme sounds. As a result, students need support thru learning media that can provide clear visual direction as well as auditory support to help them connect letters with their sounds. Without proper intervention, these barriers have

the potential to persist in basic literacy delays and cause learning difficulties in other text-oriented subjects (Komala, Sugiarto, and Juanda 2025).

Unfortunately, the learning media currently available is still limited and does not fully meet the needs of students. Conventional learning media such as textbooks and flashcards only visually display letters without providing adequate directional cues (Yuniarti et al. 2023). Meanwhile, interactive digital media is indeed starting to be widely developed, but its use is still limited to schools with stable internet access and adequate technological facilities (Gesang Wahyudi and Jatun 2024; Pristiawati 2023). This condition creates a gap because not all students have equal opportunities to access digital media. Therefore, a solution is needed in the form of a simple, innovative, easy-to-use medium that can be accessed in various learning contexts, both at school and at home.

Within the framework of inclusive education, teachers are required to present learning media that are adaptive and suitable for students' learning needs. One approach proven effective in overcoming reading difficulties is the use of multisensory media (Saleh Al Rasheed 2022). Multisensory media is media that involves more than one sense in the learning process, allowing students to learn thru a combination of visual, auditory, and kinesthetic means. (Daza Gonzalez et al. 2023) explain that multisensory integration helps strengthen the connection between letters and their sounds, while (Supriatna and Ediyanto 2021) emphasize that this approach improves students' memory and learning motivation. Thus, a multisensory approach is relevant to help students overcome confusion with similar-looking letters in reading.

Based on these needs, one of the proposed innovations is the development of a multisensory reading card equipped with reading direction arrows and a QR code. Unlike previous studies that only developed full visual or digital media, this research combines print media with simple QR videos that can be accessed in various learning contexts. The arrow serves as a visual cue to guide students to read the letters in the correct orientation, thus reducing confusion in distinguishing similar-looking letters. QR codes, on the other hand, serve as a link for students to word pronunciation videos thru simple devices like mobile phones. In this way, students gain both visual and auditory learning experiences in an integrated manner. The presence of this multisensory reading card media is a practical solution that combines the strengths of print media and simple technology, making it easy for both teachers and parents to use.

Beside benefiting students, multisensory reading card media also has the potential to strengthen collaboration between teachers and parents in supporting children's literacy development. Teachers can use it as a learning aid in the classroom, while parents can use it at home to consistently support their children's learning. This principle aligns with the concept of home-school partnership, which emphasizes the importance of the continuity of family and school roles in supporting child development (Ma et al. 2024). With the involvement of these two parties, the reading learning process becomes more intensive, enjoyable, and consistent.

Based on the description, this research focuses on developing multisensory reading card media with video QR codes as an innovative solution to overcome difficulties in distinguishing similar letters among third-grade elementary school students in Phase B. Specifically, this research aims to: (1) describe the difficulties students experience in reading similar letters; (2) design and develop simple, practical, and applicable multisensory reading cards; and (3) make a real contribution to teachers and parents in providing basic literacy learning media relevant to students' needs. With this research, it is hoped that students' basic literacy can improve, making them more confident in learning and able to achieve academic success in various subjects.

METHODS

This research uses the Research and Development (R&D) method with the 4D (Four-D Models) development model developed by Thiagarajan. This model was chosen because it is suitable for producing innovative, tested, and relevant educational products that meet the learning needs of elementary schools. Generally, the 4D model consists of four stages: Define, Design, Develop, and Disseminate (Budi Indaryanti, Murtiyasa, and Soemardjoko 2025). However, in this study, the development process was only limited to the Develop stage, resulting in the research output being an initial prototype of the learning media. This limitation is imposed because the main focus of the research is to produce a product design that is conceptually mature and meets student needs before expert validation or field testing is conducted. Thus, this research can be positioned as preliminary research, which is initial research focused on developing product designs as a solid foundation for subsequent research stages (Setiawan Putro 2018). With a structured prototype in place, further research can be directed toward evaluating the

feasibility, practicality, and effectiveness of the media in improving students' reading skills. This aligns with the characteristics of development research according to (Arifin, Rauf, and Ahmad 2023; Rahayu 2025), which state that the initial stage of research not only produces a product but also provides a conceptual and practical foundation that will guide the validation and implementation process in the field.

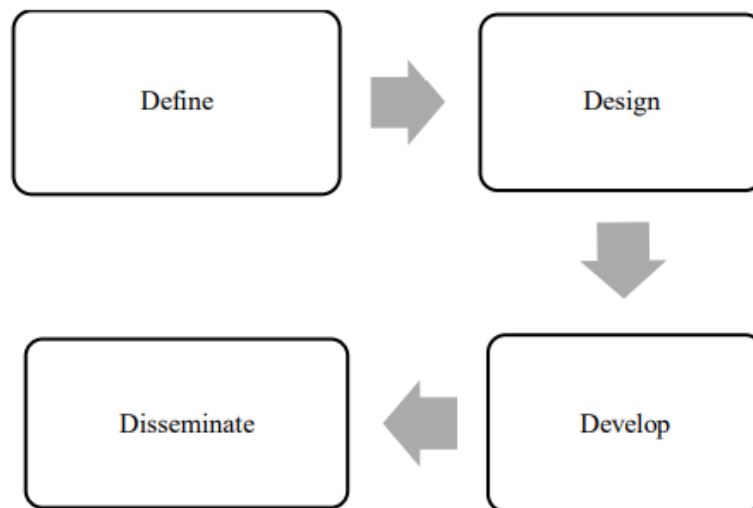


Figure 1. Tahap Pengembangan 4D

The first stage is Define, which aims to identify learning problems and real needs in the field. At this stage, an initial analysis was conducted on literacy constraints in lower elementary grades, an analysis of student characteristics who were still at the beginning reading stage, an analysis of tasks students needed to master, and an analysis of concepts to be taught thru media. The results of this analysis served as an important foundation for formulating learning objectives and product criteria, ensuring that the developed media was not only engaging but also capable of addressing the problems faced by teachers and students.

The second stage is Design, where the results of the needs analysis are translated into the design of learning media. At this stage, the initial design is created, including media format, content selection aligned with the curriculum, and the determination of presentation strategies based on a multisensory approach. Media design also considers the principles of constructivist learning theory, where students are expected to actively construct their knowledge thru concrete, visual, and auditory learning experiences. Thus, the product design is not only technical but also has a strong pedagogical foundation. The third stage is Develop. At this stage, the initial design is transformed into a learning

media prototype that can be further tested. The resulting prototype is still an early product that has not been validated by experts or tested on students. However, the tangible form of this media already integrates the findings from the definition stage and the design stage, ensuring the product has a clear direction and can be evaluated in subsequent research. By producing a prototype at this stage, the researcher provides a systematic basis for the revision, validation, and dissemination processes in subsequent research stages. The fourth stage, Disseminate, was not implemented in this study. This is because the product produced is still an initial prototype and is therefore not yet suitable for distribution. Expert validation and field testing are still necessary for the media to be declared suitable and effective for widespread use. Therefore, this research is limited, but it still makes an important contribution by providing an initial product ready for evaluation.

The final result of this research is a multisensory reading card prototype designed to support early literacy learning in elementary schools. Although it has not yet undergone validation and field testing, this product has been developed based on real needs in the classroom and is supported by relevant theoretical foundations. Thus, this research provides an initial contribution in the form of an innovative media design that can be further developed thru subsequent research to ensure its effectiveness and feasibility.

RESULTS

The results of this research are a prototype of multisensory reading card media based on QR video developed to help third-grade students at SDN Sumur Welut III overcome difficulties in reading similar letters. This product has unique characteristics because it combines print media with digital support, enabling a more comprehensive learning experience thru the integration of visual, auditory, and kinesthetic aspects.

Physically, the reading cards are designed in A6 size (10.5 x 14.8 cm) using thick ivory material that is durable and easy for students to use. The font used in the reading card design is Arial, which falls into the dyslexia-friendly category because it has a simple, consistent shape and minimal ornamentation (Setia Priyadi, Monica, and Aulia Saputri 2024). So that letters are easier for students with reading difficulties to recognize. According to educational typography studies, sans-serif fonts like Arial are considered easier to distinguish between letters compared to decorative or serif fonts that have many

curves (Setiawan and Amayati 2025). The selection of Arial in this medium is expected to reduce the risk of letter reversal, such as confusing the letters b–d or p–q, while also helping to improve students' focus during the reading process. The front of the card displays letters, syllables, or words according to reading difficulty, accompanied by a reading direction arrow that serves as a visual cue and a kinesthetic aid for students to follow the reading sequence with their fingers.

In addition to the printed aspect, this card is also enriched with digital integration in the form of a QR code placed in the front corner of the card. This QR code can be scanned using a simple smartphone and connects to a short video lasting 5–10 seconds. The video features clear pronunciation of words or syllables, a plain background to avoid distractions, and scrolling text synchronized with the audio. Thus, students can learn through auditory experience while also strengthening letter-sound associations.

This product is structured into two learning levels to gradually match students' abilities. Level 1 features cards with syllables on a light green background, while Level 2 contains simple words on a dark green background. This color differentiation serves as a visual code that makes it easier for students to distinguish difficulty levels while also providing motivation to reach the next level.

The following table summarizes the product specifications of the video-based multisensory reading cards:

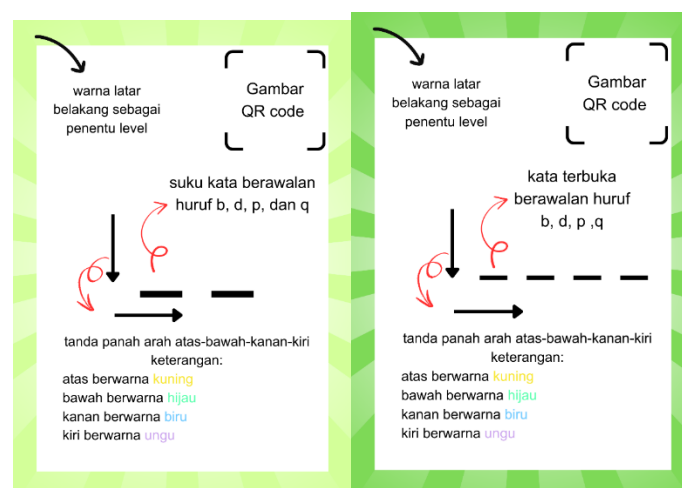
Table 1. Product Specifications for Reading Cards

Aspect	Product Specification
Size	A6 (10,5 x 14,8 cm)
Material	Thick ivory board, durable and comfortable for students to use
Font	Arial (dyslexia-friendly, simple, consistent, easy to distinguish)
Card Front Content	Syllables or words with reading direction arrows QR code linked to pronunciation video
Level 1	Syllables, light green background as a visual cue
Level 2	Simple words, dark green background as a visual cue
Video	Duration 5–10 seconds, clear-speaking presenter, cards displayed by the presenter
Learning Approach	Multisensory: visual (seeing), kinesthetic (following arrows), auditory (hearing video)

DISCUSSION

The innovation generated in this research emphasizes a multisensory approach, which is a learning strategy that integrates various sensory pathways to provide students with a richer learning experience (Sepsita and Citra Wijaya 2024). Students learn to read thru three main pathways: visually, by looking at clearly printed letters, syllables, or words on cards; kinesthetically, by following arrow marks with their fingers to concretely understand the direction of letter writing; and auditorily, by listening to word pronunciations thru videos connected to QR codes. The integration of these three pathways aligns with the principle that the more senses involved in the learning process, the greater the chance of information being stored in long-term memory (Komariah, Zainuri, and Muinuddin 2025). Thus, this medium provides an advantage over conventional reading cards, which generally only emphasize the visual aspect, resulting in stronger student memory retention and minimizing reading errors.

Overall, the results of the prototype development indicate that this QR video-based multisensory reading card media has the potential to be used both in school learning and home tutoring. Teachers can use it as a teaching aid for reading in the classroom, while parents can use it to train their children independently. Thus, this medium serves as a tool that is not only instructional but also collaborative, as it simultaneously involves the roles of teachers and parents. Documentation of the prototype can be seen in the attached image.



(a) Prototipe Level 1

(b) Prototipe Level 2

Figure 2. Prototype Card

The development of QR video-based multisensory reading card media in this study demonstrates an innovation relevant to the needs of third-grade students in Phase B at SD Sumur Welut III who still experience difficulty distinguishing similar letters. Based on initial observation results, the most frequent reading errors are the exchange of letters b–d and p–q, which visually have almost similar shapes. This difficulty aligns with findings from various literature reviews that students with literacy impairments often experience visual confusion, a condition where they struggle to distinguish between letters with similar shapes due to limitations in visual discrimination (Adhe et al. 2023). This visual confusion is one of the main factors that triggers letter reversals, such as confusing the letters b–d or p–q, which ultimately hinders reading fluency. Other research confirms that poor visual discrimination not only affects the technical aspects of reading but also has implications for students' low self-confidence in the learning process (Liriwati et al. 2024). Thus, this obstacle requires the intervention of learning media specifically designed to help students strengthen their visual discrimination skills while connecting them with phonological aspects (Badrudin et al. 2025).

The reading card media developed in this study integrates three sensory pathways, namely visual, auditory, and kinesthetic, which is known as the multisensory approach. This approach has previously been proven effective in teaching reading to children with dyslexia as well as regular students (Ismi, Witasoka, and Junari 2025). With the arrow on the card, students not only see the letters but also follow the reading direction with finger movements (kinesthetic), and strengthen the letter-sound association thru video (auditory). This supports Paivio's Dual Coding theory, which explains that information is easier to understand and remember when processed thru more than one sensory pathway (Risda, Septriwinti, and Nasution 2023). In the context of multisensory reading cards, the visual pathway is present thru text and reading direction arrow signs, the auditory pathway thru pronunciation videos, and the kinesthetic pathway thru finger movements following the direction of writing. This dual activation allows for the formation of stronger and complementary mental representations between images, sounds, and movements, thus reducing the risk of visual confusion and improving students' memory retention of similar letters (Tukang 2022). Thus, this product not only serves as a learning medium but also as a practical application of Dual Coding theory in basic literacy.

The integration of QR codes on this medium provides added value compared to conventional reading cards. Accessing short videos via QR code provides a simple and easily accessible technology-based learning experience. This innovation aligns with the development of blended learning in elementary schools, where technology serves as a support for print media in creating a more engaging and interactive learning experience (Kurniawati et al. 2024). According to (Salim 2023), blended learning allows for the integration of the advantages of face-to-face learning with digital technology support, resulting in a richer learning experience for students. Thus, this reading card is not just a static medium, but is also capable of presenting dynamic learning that is suitable for the characteristics of today's digital generation.

Additionally, the use of different colors on Levels 1 and 2 proved to provide visual stimuli that helped students identify the difficulty level of the material. This strategy aligns with Vygotsky's scaffolding theory, which emphasizes that students need to be provided with gradual support according to their zone of proximal development (ZPD) (Aprianti et al. 2025). In the context of reading instruction, multisensory reading cards serve as a scaffold that guides students to recognize similar letters thru visual cues in the form of arrows, kinesthetic support by following the direction of movement, and auditory reinforcement thru pronunciation videos. With this support, students can gradually internalize reading skills until they are finally able to read independently without media assistance. This aligns with Bruner's view that scaffolding effectively helps students build new conceptual understanding thru interaction with structured learning tools or environments (Hadiyani, Sulalah, and Widodo 2025). Visual differentiation helps guide students to gradually improve their reading abilities.

Nevertheless, there are some limitations in the implementation of this media. First, using QR codes requires additional devices like smartphones and a stable internet connection, so potential limitations in technology access are still possible, especially in areas with minimal infrastructure. Second, this media has not yet undergone extensive testing, so its effectiveness in improving reading ability needs to be further proven thru experimental research. However, the existence of this prototype already indicates the direction of developing inclusive, adaptive, and relevant learning media for elementary school students.

Considering these advantages and limitations, a video QR-based multisensory reading

card can be an alternative medium that bridges the gap between traditional and technology-based learning. This media supports efforts to improve basic literacy in elementary schools and contributes to the development of more varied and contextual learning strategies.

CONCLUSION

Conclusions This research successfully developed a multisensory reading card prototype based on video QR codes as an alternative medium to assist elementary school students in Phase B who have difficulty distinguishing similar letters, particularly b–d and p–q. This media is designed by combining a multisensory approach thru simultaneous visual, kinesthetic, and auditory engagement. Visual learning is facilitated by using dyslexia-friendly fonts and reading direction arrows; kinesthetic learning is achieved thru student interaction in following the arrow directions using their fingers; and auditory learning is obtained from accessing word pronunciation videos via QR codes. The integration of these three aspects strengthens the letter-sound association, which is expected to minimize reading errors and boost students' confidence when practicing reading.

The main advantage of this medium lies in its simple, practical, yet innovative design, as it is able to combine printed cards with digital technology without requiring complex devices. Thus, this medium can still be implemented in schools with limited facilities, while also aligning with the needs of a generation of students familiar with technology. Using different colors for each card level also provides additional stimulation for students, allowing them to learn to read gradually according to the level of difficulty, starting from syllables, words, and simple sentences.

From a contribution perspective, the results of this research add to the relevant R&D-based learning media development references that are relevant to real-world problems in elementary classrooms. This multisensory reading card media not only emphasizes cognitive aspects but also supports inclusive learning by providing alternatives for students with literacy barriers. This aligns with the goals of basic education to provide learning services that are adaptive to the diversity of student abilities.

However, this research still has limitations because it has only reached the prototype development stage without undergoing expert validation or field testing. This means that the empirical effectiveness of media in improving students' reading abilities has not yet

been confirmed. Therefore, further research is needed to conduct content validation, usability testing, and both quantitative and qualitative testing regarding the improvement of students' reading skills after using this media.

As a practical recommendation, teachers can utilize this prototype as a supporting medium for early reading instruction, particularly for students who show difficulty distinguishing similar-looking letters. Teachers can also develop variations in video content based on local needs or additional materials that align with the curriculum. Meanwhile, future researchers are advised to expand the development of this media to the implementation and evaluation stages, including integrating gamification features or simple applications to make the media more interactive.

With continuous improvement, this video-based QR code multisensory reading card has the potential to become one of the innovative solutions in supporting the improvement of basic literacy in elementary schools, especially in the context of learning that still faces resource limitations.

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