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Preliminary Exploration of Digital Big book Media to Enhance Scientific Literacy among Elementary School Students

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Abstract
This preliminary study explores the potential of digital Bigbook media to improve scientific literacy among elementary school students in Indonesia, focusing on a case study at UPT SDN 155 Gresik. The research was conducted in response to challenges identified in science instruction, particularly on the topic of the human digestive system, where conventional teaching methods and limited media use have led to low student engagement and weak conceptual understanding. An exploratory qualitative approach was adopted through classroom observations, teacher interviews, and document analysis to identify current instructional practices and learning needs. The study involved one fifth-grade class consisting of 25 students and one science teacher, with data collected over a period of three weeks. The results reveal that teaching heavily relies on lecture-based instruction and textbook illustrations, with minimal integration of interactive or visual media. Teachers expressed a strong need for engaging, narrative-based digital media to help students visualize complex scientific processes. Digital Bigbooks, which combine storytelling with scientific content and vivid illustrations, were identified as a promising medium that aligns with the principles of meaningful learning and constructivist pedagogy. The findings also highlight the importance of media that support differentiated learning and accommodate the learning preferences of digital-native students. This initial exploration provides foundational insights for the development of a digital Bigbook prototype tailored to the elementary science curriculum. The study concludes that digital Bigbooks offer a feasible and contextually relevant solution to enhance science learning experiences and students' scientific literacy. Recommendations include prototype development, pilot testing, and teacher training to ensure effective implementation. This study contributes to the growing body of literature on digital media in elementary science education within the Southeast Asian context.

INTRODUCTION

Science is one of the important fields of study in elementary education because it provides a basis for logical, critical, and scientific thinking for students. Science education in elementary schools aims not only to instill scientific concepts, but also to form scientific thinking skills and daily problem-solving skills (Pratama et al., 2023). However, in reality, students' understanding of science material is still relatively low, especially in abstract topics such as the human digestive system. Many students have difficulty understanding biological processes that cannot be observed directly, so they tend to experience misconceptions (Ismawanti et al., 2023). This is exacerbated by the use of learning media that is still conventional and has minimal visualization. Teachers often rely only on textbooks as their primary learning resource without the help of adequate visual aids. This condition causes the learning process to be less interesting and ineffective. As a result, the level of science literacy of students has not reached the expected target.

Science literacy is an important component of science learning because it includes understanding concepts, process skills, and scientific attitudes that students must have (Le et al.,

2022). According to Hudson et al. (2021), science literacy includes not only scientific knowledge, but also the ability to apply science in the context of daily life. In the context of learning in elementary schools, science literacy is an important foundation to form a generation that is technologically literate and able to think critically (Solihin et al., 2024). Therefore, the approach and learning media used must be able to facilitate active and meaningful student involvement. Interesting and contextual learning media has been proven to be able to increase students' motivation to learn and understand the material (Fletcher et al., 2024). One of the media that has the potential to support this is digital-based media with a visual approach. Thus, strengthening science literacy through the use of digital media is an urgent need in the current basic education system.

Bigbook is one of the narrative and visual-based learning media that was originally developed for language literacy learning at the elementary education level. This medium is in the form of large picture books designed to be read together in groups or classes, with simple text and attractive images that help comprehend the content of the reading (Agustina et al., 2022). In its digital form, the Bigbook is enhanced with multimedia elements such as animations, interactive buttons, narration, background sounds, and hyperlinks that enable students to explore concepts independently and dynamically. A "digital Bigbook" therefore integrates visual storytelling, interactivity, and multimodal learning resources, which distinguish it from static picture books. From a theoretical perspective, the use of digital Bigbooks aligns closely with constructivist pedagogy, which emphasizes that students actively construct knowledge through interaction with learning materials and meaningful experiences. According to Piaget and Vygotsky's constructivist principles, learning becomes effective when students are engaged in connecting new information with prior knowledge through contextual and interactive activities. The digital Bigbook supports these principles by allowing learners to visualize abstract concepts, manipulate information through digital interactions, and engage collaboratively in shared reading or discussion. This approach encourages inquiry-based learning, reflection, and conceptual understanding — key elements of constructivist science education.

In the Indonesian context, several studies have explored similar interventions that integrate digital storytelling or interactive media in science learning. For example, Naresti (2024) found that digital storybooks improved conceptual understanding and retention among elementary students in Bandung. Likewise, Dewi & Setyasto (2024). In the context of science learning, this media can be used to present scientific processes such as the human digestive system in a more concrete way. The visual and illustrative narratives presented through the digital Bigbook are able to help students connect abstract information with real experiences. Therefore, the use of digital Bigbooks is a relevant alternative for science literacy-based learning. This media not only supports the cognitive aspect, but also improves the affective and psychomotor aspects of students.

Based on initial observations made at UPT SDN 155 Gresik, it was found that the science learning process is still conventional and lacks media innovation. Teachers tend to rely on lecture methods and read textbooks without the use of attractive visual aids. This has an impact on the low active participation of students in learning activities and difficulties in understanding the concepts conveyed (Adju et al., 2023). In informal interviews, some teachers stated that they needed a medium that could bridge students' limited understanding of abstract concepts. Students also show greater interest when teachers use short videos or illustrative images. However, the use of these media is still limited and unstructured in the form of systematic learning. This condition indicates the need for intervention in the form of innovative learning media that is able to present material visually, attractively, and integratedly. In addition, it is important to consider the level of digital literacy among elementary students, especially in urban schools such as Gresik. As digital natives, most students are already familiar with mobile devices and multimedia content, but their ability to use technology for learning purposes is still developing. Therefore, digital Bigbooks have the potential to serve as a transitional medium that combines entertainment-oriented digital familiarity with educational objectives.

Previous studies have shown that the use of digital media can significantly improve students' understanding of science materials. Research by Putra (2024) states that interactive visual media is able to increase students' interest in learning and science literacy simultaneously. In addition, the use of technology in learning has been shown to improve time efficiency, teaching effectiveness, and material appeal. With the help of digital visualization, processes that cannot be directly seen such as digestion can be visualized animatively and contextually. The use of digital Bigbook media allows students to explore the material independently or with the teacher in class. This media can also be used flexibly in various learning models, both face-to-face and online (Afifah et al., 2024). Therefore, it is necessary to conduct further research on the effectiveness of the use of digital Bigbooks in science learning. The first step of the research is the exploration of the needs and potentials of media through a pre-thesis study.

Based on this background, the researcher feels the need to conduct initial exploration to find out the extent to which digital Bigbook media can be adapted in the context of science learning in elementary schools. This exploration will focus on identifying problems, the needs of teachers and students, as well as a theoretical review of the effectiveness of similar media. The results of this exploration are expected to be the basis for designing and developing digital Bigbook media that suits the characteristics of students and the curriculum. In addition, this research also contributes to the development of innovative learning models based on science literacyBy integrating visual, narrative, and digital-interactive approaches grounded in constructivist principles, this media is expected to be able to be a solution to the problem of low science literacy of students. Therefore, this article presents the results of the initial exploration of the use of digital Bigbooks at UPT SDN 155 Gresik as the basis for thesis development. It is hoped that the results of this study will contribute to improving the quality of science learning at the elementary education level in general.

METHODS

This study uses an exploratory qualitative approach that aims to gain an in-depth understanding of the needs, potentials, and relevance of using digital Bigbook media in science learning in elementary schools. The selection of this approach is based on the nature of the pre-thesis research, which aims to collect preliminary information before the media development stage is conducted as part of the thesis project. The research was conducted at UPT SDN 155 Gresik, focusing on Grade V students who were learning the human digestive system topic. The research subjects consisted of Grade V teachers, students, and instructional documents used in the school. Data were collected through classroom observations, semi-structured interviews, and document analysis of the syllabus and media used during the learning process.

The observation technique was carried out in a passive participatory manner, where the researcher directly observed the learning process without providing intervention. Observations focused on the teaching strategies used by teachers, the types of media utilized, and students' engagement and responses toward science materials.

Interviews were conducted with Grade V teachers to explore their perceptions, challenges, and needs related to effective science learning media. In addition, document analysis (lesson plans, textbooks, and other teaching materials) was used to examine the alignment of content with visual approaches and scientific literacy indicators.

All data were analyzed using thematic analysis techniques. The analysis procedure included the following detailed steps:

1. Data Familiarization – reading and re-reading observation notes, interview transcripts, and documents to obtain an overall understanding.
2. Initial Coding – identifying and marking significant statements or patterns related to instructional practices, media use, and literacy aspects.
3. Theme Categorization – grouping similar codes into broader themes such as *teacher perception*, *media challenges*, and *students' engagement*.

4. Reviewing and Refining Themes – checking the coherence of each theme with the raw data and merging or redefining themes where necessary.
5. Drawing Conclusions and Interpretation – synthesizing themes to construct a comprehensive picture of the needs and potential development of digital Bigbook media.

Table 1. Design of Preliminary Exploration Activities

No	Type of Activity	Objective	Subject(s)	Instrument	Implementation Time
1	Classroom Observation	To identify media and teaching methods in science learning	Teachers & Students	Observation sheet	Week 1
2	Teacher Interview	To explore instructional needs and challenges	Grade V Teacher	Interview guide	Week 2
3	Document Analysis	To analyze curriculum and learning media	School Documents	Document checklist	Week 2
4	Data Analysis	To compile findings from the exploration	–	Field notes	Week 3

Through these methods, it is expected that a comprehensive overview of the needs for developing digital Bigbook media will be obtained as an effort to enhance elementary students' scientific literacy. The results of this exploration serve as the conceptual foundation for designing the media prototype and constructing the research framework for the subsequent thesis study. The entire research process was conducted in compliance with research ethics, including obtaining consent from the school and maintaining the confidentiality of participant identities.

RESULTS AND DISCUSSION

Research Results

The results of the initial exploration carried out at UPT SDN 155 Gresik show that the science learning process, especially in the material of the human digestive system, is still dominated by conventional approaches. Based on the results of class V observations, teachers tend to use simple lecture and discussion methods, while the media used is limited to textbooks and static images from Student Worksheets (LKS). No use of interactive media or digital visuals was found during the learning process. The students seemed less enthusiastic and some of them showed confusion when the teacher explained the flow of the digestive process with only a two-dimensional picture on the board.

Interviews with grade V teachers corroborated the observational findings. Teachers stated that the limitations of devices, digital skills, and the availability of appropriate learning media are the main obstacles. The teacher also said that students show higher interest when shown visual or animated media, even if it is only in the form of a simple video from the internet. Teachers expressed the need for narrative, visual, and interactive media, which could be used to explain scientific processes in a gradual and interesting manner. Thus, teachers are very open to the idea of using digital-based Bigbook media that can support science learning in a more communicative manner.

To clarify these findings, table 2 of the results of the initial exploration based on triangulation between observations, interviews, and documentation studies is presented.

Table 2. Summary of Preliminary Exploration Findings at UPT SDN 155 Gresik

Aspect	Observation Findings	Interview Findings	Document Analysis
Teaching Methods	Science instruction predominantly used lecture-based delivery and limited discussion.	Teachers rely heavily on lectures due to limited access to instructional media.	Lesson plans primarily emphasize conventional, teacher-centered approaches.
Media Utilized	Only textbooks and board illustrations were observed; no use of multimedia or	Teachers reported an absence of structured digital media in teaching	No specific mention of visual or digital media in the instructional

	visuals.	practices.	documents.
Student Response	Students appeared disengaged and confused during science explanations.	Students showed more interest when exposed to visual aids or video-based content.	Learning activities lacked exploratory and student-centered components.
Teacher Needs	Teachers expressed a need for visual, interactive, and user-friendly media.	There is a strong demand for media that illustrate scientific processes clearly.	No supplementary teaching materials or support media were documented.

Based on the results of the data triangulation above, it can be concluded that there is a real need for learning media that is able to present information visually and narratively to improve student understanding. The results of this exploration strengthen the suspicion that digital bigbook media is very relevant to be developed as a solution to the problems faced by teachers and students. In addition, these findings are also a strong basis for researchers to continue research to the media development stage in thesis research.

Pembahasan

The results of the initial exploration show that the science learning process at UPT SDN 155 Gresik is still less than optimal in utilizing innovative learning media. Teachers use more lecture methods and limited learning resources such as textbooks and static images. This condition has an impact on the low involvement of students in learning and the weak understanding of science concepts. Science literacy requires a contextual, visual, and applicative learning approach so that students can relate science to real life (Risna et al., 2023). The digestive process as one of the topics in science material in class V requires learning media that is able to visualize biological processes that cannot be observed directly. Students' non-involvement in the meaningful learning process is an obstacle to the development of their scientific thinking skills. This shows that text-based learning strategies alone are not enough to achieve the goals of science education at the elementary level. The teacher stated that there are limitations both in the availability and mastery of digital media that can help the delivery of material. Therefore, technological integration is an urgent need in basic education. Bigbook digital media is present as one of the potential solutions to overcome these challenges (Wandini et al., 2021).

Digital bigbooks are media that combine narrative texts with visual illustrations that support literacy and science learning. Initially, Bigbooks were more widely used in the context of language learning and reading (Naresti, 2024). However, its development has now begun to expand to various subjects, including science, by prioritizing visual, narrative, and interactive elements. This media is designed to make it easier for teachers to convey complex material through visual stories that are tailored to the level of students' cognitive development. According to Kadir et al. (2024), the combination of visualization and narrative has been proven to be able to improve conceptual understanding and information retention in elementary school-age children. In addition, digital Bigbooks can be used collaboratively in the classroom or independently by students. This advantage provides flexibility in the implementation of various active learning models, such as group discussions and project-based learning. In the context of science learning, visualization of processes such as the digestive system through digital media allows students to understand the sequences, functions, and interactions between organs more clearly (Solihin et al., 2025). With this approach, learning becomes more concrete and can encourage active student engagement. Therefore, digital Bigbook media is very relevant to be adapted in science learning in elementary schools.

The findings of the study also reveal that teachers urgently need media that is in accordance with the curriculum, easy to use, and supports learning outcomes that emphasize strengthening science literacy. Science literacy is not only about understanding scientific facts, but also the ability to evaluate scientific information and apply it in decision-making (Mawa et al., 2024). In this case, digital

media such as Bigbook can serve as a bridge between scientific concepts and students' real experiences. The illustrations and stories in the Bigbook help to contextualize abstract concepts into more meaning. The use of this medium also supports differentiated learning because it allows students to learn according to their learning style. Teachers can develop this media based on the material and characteristics of students in their classes. Additionally, digital formats allow for multimedia integration such as sounds, animations, and interactive quizzes. This is in line with Parwati et al. (2024), who stated that learning will be more effective when information is presented through a combination of text, images, and sound. Thus, digital Bigbook media can be an effective strategy in building students' science literacy from an early age.

Analysis of the documentation of the lesson plan and teaching materials shows that the learning media used has not fully supported the development of high-level thinking skills. Learning activities are still procedural and focus on memorizing concepts. This shows the incompatibility between the objectives of the independent curriculum that prioritizes competency-based learning and practice in the field. According to Nurmahanani (2024), the independent curriculum emphasizes differentiated learning that provides space for students to build their own understanding. In this context, digital Bigbook media has the potential to support a constructivist approach by providing a more active and exploratory learning experience. With visual narratives that present real problems, students are encouraged to think critically and creatively in understanding the material. Activities such as reading Bigbooks together, discussing, and making simple projects can develop students' scientific thinking skills (Novitasari, 2021). Therefore, the integration of Bigbook media into learning planning is essential to improve the quality of learning processes and outcomes. Adapting to technology also helps teachers meet the needs of today's digital-native generation.

Furthermore, the results of observations showed that students were more enthusiastic about learning that involved visual and interactive elements. Student engagement increases when teachers show images or videos related to the digestive system. This is in line with the results of previous research showing that visual media can increase students' attraction and attention in learning (Oktaviana et al., 2021). In science learning, students' attention is essential to build a solid foundation of scientific knowledge. When students are actively engaged, they will have an easier time understanding and remembering the material being studied. Digital bigbooks, with attractive visual designs, can spark curiosity and help students build conceptual understanding gradually. The use of narratives that are appropriate to the context of students' lives also makes learning more relevant and meaningful (Zainudin et al., 2023). Therefore, this media has the potential to be an important instrument in strengthening the science learning experience at the elementary school level. The active participation of students in reading and discussing Bigbook content also trains their collaborative and communication skills. In addition to pedagogical advantages, the use of digital Bigbooks also brings benefits in terms of accessibility and flexibility of learning. Digital media allows teachers and students to access materials from a variety of devices and locations. In mixed or online learning situations, these media can still be used with high effectiveness. According to Solihin et al. (2024), access flexibility is one of the main advantages of digital learning media. Digital bigbooks can also be adjusted to various conditions, such as screen size, study time, and student interests. In schools with limited tools, Bigbooks can still be printed in a large format for manual use (Oktaviana et al., 2021). Therefore, this media is adaptive to the situation and educational needs. Thus, the development of digital Bigbooks is a relevant investment for 21st century learning. Teachers can also be empowered to create and modify Bigbooks according to their respective local contexts.

However, there are several challenges in the implementation of digital Bigbooks that need to be considered. The availability of devices, internet networks, and teachers' digital skills are factors that determine the success of using this media. Based on the results of the interviews, some teachers feel that they are not confident enough in operating technology-based media. Therefore, teacher training and mentoring are important aspects of the digital Bigbook development strategy. In addition, there needs to be support from schools in the provision of technology-based learning facilities and policies.

Without systemic support, the media developed will not be optimally used. According to Zainudin et al. (2023), educational change does not only rely on device innovation, but also on the readiness of school systems and culture. Therefore, the development of digital Bigbook media must be accompanied by a holistic and sustainable implementation strategy. The involvement of teachers in the development process will also increase the sense of ownership of the media used. In terms of design, digital bigbooks must pay attention to the principles of pedagogy, readability, and visualization that are in accordance with the characteristics of elementary school students. The illustrations used must be interesting but still scientifically accurate (Putri & Agustiana, 2023). Narrative texts need to be structured in simple, communicative, and contextual language. The addition of interactive elements such as quizzes, animations, or simple challenges can increase student participation. According to Mahmud et al. (2022), digital media designed based on the principle of universal design for learning (UDL) is more effective in reaching all students with various learning styles. By accommodating the diverse needs of students, digital Bigbooks can be an inclusive learning tool. Therefore, the initial exploration stage such as in this study is important as the basis for relevant and effective media design. Involving students and teachers in the design stage can also improve the quality and acceptance of media (Fitri, 2022). This is the first step towards the development of media based on real needs in the classroom.

This exploration also shows that the development of learning media cannot be done in isolation from the school context. The learning environment, school culture, and teacher's teaching style greatly influence the success of the implementation of innovation (Mardiyana & Dafit, 2022). Therefore, there needs to be a collaborative approach between researchers, teachers, and schools in designing appropriate media. This pre-thesis research is the foundation for identifying needs, challenges, and opportunities in the development of digital Bigbook media. According to Nurhayati et al. (2024), in the design-based research approach, exploratory preliminary studies are very important to understand the context before designing educational solutions. By understanding the characteristics and needs of science learning at SDN 155 Gresik, media development can be more on target. The results of this exploration also provide a practical overview for the development of media prototypes in the next thesis. This is a strategic initial contribution in efforts to improve the quality of science learning in elementary schools.

Based on the overall discussion, it can be concluded that the use of digital Bigbook media has great potential to improve the science literacy of elementary school students. This media not only answers the challenges of science learning which is abstract, but also provides a fun and contextual approach (Putri et al., 2024). The results of the exploration support that teachers and students urgently need visual, narrative, and easy-to-use media. In addition, the integration of technology in learning media is also a step towards an educational transformation that is more adaptive to the times. This research shows the importance of understanding the real conditions and needs in the field before developing learning innovations. Therefore, this initial exploration became a strong conceptual and practical basis in the development of digital Bigbook media. It is hoped that the results of the next research can test the effectiveness of this media in improving students' science learning achievements. In the future, this media model can also be replicated for other science topics. Thus, the development of digital Bigbooks is a concrete step in strengthening science literacy since elementary education.

CONCLUSION

Based on the results of the initial exploration carried out at UPT SDN 155 Gresik, it can be concluded that science learning on the human digestive system still faces a number of challenges, especially in terms of effective and interesting use of learning media. Teachers still rely on lecture methods and conventional media such as textbooks and static images, which have proven to be less able to improve students' conceptual understanding. The lack of use of digital media leads to low student involvement in the learning process. Meanwhile, both from the results of observation and

interviews, it was found that students showed higher interest when learning was accompanied by visual and narrative elements. These findings show that there is a real need for learning media that can accommodate students' learning styles and help them visually understand abstract concepts. Digital Bigbook media is considered very potential because it presents material in the form of an interesting and educational visual narrative. In addition to strengthening science literacy, this media also supports the implementation of independent curriculum-based learning that encourages meaningful and contextual learning activities. Therefore, the development of digital Bigbook media is a strategic step to answer the challenges of science learning at the elementary school level.

For future researchers, it is recommended to develop a digital Bigbook media prototype based on these exploratory findings and test it through limited trials to assess its effectiveness in improving students' science literacy. For teachers and educators, it is hoped that they will be open to the use of digital media in learning, especially visual and interactive media such as Bigbook, in order to increase students' attractiveness and understanding of science materials. For schools, it is recommended to provide support in the form of ICT facilities, training on the use of digital media, and collaborative spaces for teachers to design and share innovative learning media. For media developers and local governments, the results of this exploration can be the basis for developing education digitalization policies or programs that are adaptive to the needs of science learning at the basic education level.

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