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Development of Digital Pop Up Book Media to Minimize Misconceptions about the Digestive System in Elementary School Science Learning

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Abstract

Science learning in elementary schools aims to instill a correct understanding of concepts so that students avoid misconceptions. However, in the digestive system material, many misconceptions are still found, for example the function of organs, the sequence of processes, and digestive disorders. One way to overcome this is to use learning media. However, so far learning media to minimize misconceptions are still rarely found. This study aims to 1). Describe the design of digital Pop-Up Book media on the digestive system material, 2). Test the validity of digital pop-up book media on the digestive system material based on the results of expert validity assessments, 3). Test the practicality of using digital pop-up books with dynamic simulations as learning media. This type of research is Research and Development (R&D) with a 4D model (define, design, develop, disseminate), which is limited to the Develop stage. The research subjects included teachers, fifth grade students of Muhammadiyah 2 Surakarta Elementary School, and expert validators. Data were collected through observation, interviews, questionnaires, pretests, and documentation. Data analysis techniques were qualitative data analysis in the form of (data reduction, data presentation and conclusion drawing). quantitative data analysis in the form of pre-test, validity test, and product practicality. The results of the study showed that 1) The media developed was a PowerPoint-based Digital Pop-Up Book containing interactive illustrations, 2D visuals, and animations of the digestive process. 2). The validity of the Digital Pop Up Book Media was declared "Very Valid" (94.28%) by media experts and "Very Valid" (90.90%) by material experts. The practicality test obtained (91.66%) "Very Practical" from the fifth grade homeroom teacher.Thus, the developed Digital Pop-Up Book is not only suitable for use on a wider scale by first establishing a hypothesis to test its effectiveness in increasing student engagement and reducing misconceptions in elementary school science learning.

Keywords: Digital Pop Up Book, Digestive System, Elementary School Science

Introduction Section

Education is essential for human life, meaning that every citizen of the Republic of Indonesia has the right to a better education. One level of education in Indonesia is elementary school. Elementary schools, as educational institutions, essentially aim to prepare students for a better life. One of the subjects taught in elementary school is science. Science is a learning concept regarding natural phenomena. Through science learning, it can provide students with opportunities to gain new experiences, which motivate them to develop concepts that are scientifically strong (Studhalter et al., 2021). In line with this, science learning in elementary schools plays a crucial role in building students' conceptual understanding and thinking skills from an early age. One of the materials taught is the human digestive system. The human digestive system is a subject that students find difficult. According to (Nurhalizah et al., 2022), the human digestive system is a complex subject to understand in terms of language and discussion without the use of innovative learning media. In the digestive system material, students often experience difficulties because the digestive process takes place inside the body and cannot be observed directly. This condition often gives rise to misconceptions, namely understandings that do not align with scientific explanations (Dewi & Purnomo, 2021). In fact, erroneous understandings need to be immediately detected and corrected to prevent hindering the learning of subsequent concepts. To address this in the process, teachers act as facilitators who strive to create a pleasant learning atmosphere by utilizing various learning media, especially innovative and interactive media (Ndraha, H., Harefa, 2023). Anwariningsih in Arum & Desstya (2021) explains that media is a carrier of messages or information with

instructional purposes to achieve learning objectives. Based on this understanding, with the presence of learning media, the learning process becomes more fun and enjoyable. In line with the increasingly advanced development of digital technology in the current era of development, especially in the fields of communication and information. Education is one of the fields affected by the development of digital technology. The application of digital technology in the world of education can be applied in the form of learning media. Learning media is a tool used to assist in conveying information and stimulating the learning process (Novaliendry et al., 2020). Teachers can utilize appropriate learning media. Pop Up Books are an alternative because the 3D visuals they display can make abstract concepts more concrete and engaging for students (Pratama & Widodo, 2023). Pop-Up books are a fairly effective and engaging medium for use in the learning process.because it can encourage active interactions in a joyful learning atmosphere (Yuliristiani, 2021). Along with technological advances, digital-based learning media has become a potential solution to increase learning effectiveness (Rahayu et al., 2022). Digital learning media is one form of learning media innovation. Education in the current era has begun to implement technological innovation in learning media (Hanifah et al., 2024). This media needs to be modified into a digital version to provide a more relevant and in-depth learning experience.

Based on interviews with fifth-grade homeroom teachers at Muhammadiyah 2 Surakarta Elementary School, classroom learning is still dominated by lectures, resulting in teachers becoming the center of information and students tending to be passive. This passive learning environment results in low student mastery of the material. This is evident from the pre-test results, which showed that students' initial understanding of the digestive system was still low, with an average of only 19.73%. This condition emphasizes the need for innovation through more engaging learning media that can increase student engagement. Therefore, the use of learning media is a crucial aspect in creating a more effective learning experience. This is further supported by findings by Devi (2021) and Syalom (2020), which show that Pop-Up Book learning media is widely used in science learning, particularly on the human digestive system, because it has been proven to increase student interest and learning outcomes. The attractive three-dimensional visual display makes students more enthusiastic and focused in participating in the learning process (Devi, 2021; Syalom, 2020).

Although several studies have shown improvements in learning outcomes, students still have high levels of misconceptions about the digestive system, particularly regarding organ function and the digestive process (Pijiharjo, 2021; Gresik, 2022). This is influenced by the limitations of conventional Pop-Up Books, which emphasize surface visuals, leading students to memorize organ shapes without understanding the in-depth interrelationships between them (Sawit Permai, 2021). This situation indicates a gap between increased learning motivation and a true understanding of scientific concepts (Walisongo, 2021). Therefore, learning media are needed that are not only visually appealing but also capable of deepening conceptual understanding. The choice of media can also affect the learning process and student activity, so that in this era of increasingly advanced technological developments, teachers are required to choose appropriate learning media that suit students' needs (Raihany et al., 2022). The development of interactive digital Pop-Up Books is one solution because they are equipped with animations or simulations that can help reduce misconceptions and strengthen the scientific literacy of elementary school students (Nambangan Kidul, 2021; Lamasi, 2021).

Various studies have shown that pop-up books are effective in increasing student motivation and understanding in science learning. (Hasanah (2021) and Rahmawati (2022)) found that this medium can increase interest and conceptual understanding, particularly in the digestive system.

However, conventional pop-up books are still limited to static visuals, making them less effective at addressing misconceptions (Lestari, 2020). Therefore, digital-based development is crucial. Multimedia and AR pop-up books have been shown to help reduce misconceptions through more interactive animation and 3D visualizations (Sari, 2022; Sasmito, 2021). In this digital era, digital pop-up books offer an alternative to increase learning effectiveness. According to Sholichah, pop-up books, as 3D media, provide visual appeal because the images appear when the page is opened, and the material can be customized (Khamidah & Sholichah, 2022). Other findings also confirm that 3D design innovation and digital technology integration can improve student understanding and interactivity (Ananda, 2020; Nengsih, 2020; Laksmi, 2021). As a result, some students still experience misconceptions regarding the function and working processes of the digestive organs. This condition emphasizes the need to develop more interactive and conceptual media, such as digital pop-up books equipped with digestive process simulations. The interactive digital media allows students not only to see the shape of the organ, but also to understand its workflow and function more comprehensively, thus potentially reducing the level of misconceptions and improving conceptual understanding. This study aims to: 1) Describe the design of digital Pop-Up Book media on the digestive system material, 2) Test the validity of digital pop-up book media on the digestive system material based on the results of expert validity assessments, 3) Test the practicality of using digital pop-up books with dynamic simulations as learning media according to teachers..

Methods

2.1 Types and Designs

This study uses the Research and Development (R&D) method, a focused research method oriented towards producing innovative products or models through systematic scientific procedures. Researchers (Waruwu, 2024) state that development research begins with problem analysis, then continues with the design, development, implementation, and product evaluation stages, so as to produce tested and effective innovations. The product developed in this study is a digital Pop Up Book media containing material on the human digestive system. This media is designed to help elementary school students understand abstract concepts in the digestive system and minimize misconceptions that often arise in science learning. This study uses a 4D development research model consisting of define, design, develop, and disseminate. However, this study did not reach the disseminate stage.

2.2 Data and Data Sources

The data used in this study are quantitative and qualitative data. Qualitative data include the results of observations during the learning process, interviews with class teachers and documentation. For quantitative data obtained in the form of pre-test results to measure misconceptions on the digestive system material, and scores given by expert validators and questionnaires given by teachers to determine the level of practicality of the Digital Pop Up Book media. Data sources in this study include homeroom teachers and fifth-grade students of Muhammadiyah 2 Surakarta Elementary School through tests, questionnaires, observations, interviews and supporting documents.

2.3 Data collection technique

The data collection techniques in this study used several methods such as observation, interviews, questionnaires, pre-tests, validation sheets, and documentation. Observations included observations to determine the condition of misconceptions and media that had been used in the learning process. Interviews were conducted with the homeroom teacher of fifth-grade of Muhammadiyah 2 Surakarta Elementary School. Questionnaires were given to teachers as practitioners to analyze the practicality of digital pop-up book media in the form of a Likert scale. This pre-test was used to measure conceptual understanding as well as identify student misconceptions on the digestive system material, this test was in the form of reasoned multiple choices. This validation sheet was to obtain input and assessments from media experts and material experts regarding the feasibility of digital pop-up book media. In addition, documentation was used as supporting data obtained through photos and other archives. This technique helped researchers obtain real evidence and strengthen field findings, while providing validity to previously collected data.

2.4 Data Analysis Techniques

This data analysis technique uses two methods: quantitative descriptive analysis and qualitative analysis. The quantitative descriptive analysis technique calculates the pre-test results using a two-tier multiple-choice diagnostic test to determine initial understanding of misconceptions, a product validity test, and a practicality test to analyze the practicality of the Pop Up Book Digital media. The pre-test results were analyzed using the formula below.

$$P = \frac{F}{N} \times 100$$

Information :

P: Percentage of student answers to each question

F: Frequency of student answers to each question

N : Total students

The pre-test result sheets are categorized in Tables 1 and 2.

Table 1.Two-tier multiple choice student answer patterns

Student answer patterns	Understanding level categories	Score
B – B	Understanding the concept	3
B – S	Misconception	2
S – B	Misconception	1
S – S	Don't understand the concept	0

Source: Pongkendek, JJ, & Kristyasari, ML (2022).

Table 2. Percentage score

Student grades (%)	**Assessment categories**
81 – 100%	Very good
61 – 80%	Good
41 – 60%	Enough
21 – 40%	Not enough
0 – 20%	Very less

Source: Sofiyana et al., 2022

Furthermore, this data analysis technique also utilized expert validation instruments and the practicality of the Digital Pop-Up Book media. The validity and practicality criteria are explained as follows.

Expert validation criteria are calculated using the following formula:

$$P = \frac{\sum x}{\sum x\text{i}} \text{ x } 100\%$$

Information:
P = Validation test value
$\sum \boldsymbol{x}$ = Total score
$\sum \boldsymbol{x}$i = Maximum value

The validator result sheets are categorized according to Table 3.

Table 3. Expert validation assessment criteria

Mark	Assessment categories
81 – 100%	Very Valid
61 – 81%	Valid
41 – 61%	Quite Valid
21 – 41%	Less Valid
0 – 21%	Totally Invalid

Source: Baihaqi & Wulantina (2023)

Meanwhile, the practicality criteria for pop-up media are explained in Table 4.

Table 4. Practitioner questionnaire assessment criteria

Mark	Assessment categories
81 – 100%	Very Practical
61 – 80%	practical
41 – 60%	Quite Practical
21 – 40%	Less practical

Source: (Febriandi.,et.al. 2020)

This qualitative data analysis technique refers to the design according to Miles and Huberman, which consists of three components: data reduction, data presentation, and conclusion drawing. The results of the qualitative analysis serve as support for the quantitative data, providing a more complete picture.

Results and Discussion

Digital Pop Up Book Media Design

Based on the validator's assessment of the developed Digital Pop Up Book product, and then revisions were made based on input from the media expert validator and the material expert validator, the Digital Pop Up Book media design was obtained which showed that this pop up book was packaged in digital form for fifth-grade of elementary school which contains the digestive system material, which aims to minimize misconceptions that at the beginning there are trigger questions that condition students to learn in a state of cognitive conflict. One important finding comes from the study of (Yanto, Muliana, and Zubair., 2023) who conducted a literature review on the use of pop-up books in science learning. They found that pop-up books were able to improve students' understanding of science concepts because of the integration between text, images.With The visual design was developed using two main platforms, Canva for engaging visual design and PowerPoint for adding interactive animations. Research conducted by (Kartikasari & Rahmawati, 2022) revealed that PowerPoint can be used as an effective alternative learning medium. Therefore, PowerPoint was chosen because of its ease of use and its ability to present animations that support the delivery of material while paying attention to readability, color compatibility, and animations that suit the characteristics of elementary school-aged children. This is in line with the findings of (Rahiem, 2021) which revealed that the open research market chose PowerPoint because it is easy for teachers to use and can be opened on other computer devices and has a long shelf life. The final result is a digital Pop-Up Book that can be used on devices such as laptops. Figure 1 shows the cover display of the Digital Pop-Up Book media:

Figure 1. Digital Pop Up Book Cover

This media is structured like a Pop Up book, where each slide displays a section of the digestive organ material with simple yet attractive static animated illustrations for elementary school students. Students prefer digital technology-based learning media that can easily see real examples by providing images. This is in line with the opinion (Mansor et al. 2020 and Ploetzner et al. 2020), namely that digital animation can improve students' learning abilities faster and better. Although it does not use interactive buttons, switching between slides is only done with one click so that the presentation still feels natural and easy to use in learning activities. This simple display structure helps teachers organize the flow of explanations without complicated navigation distractions, so that students can follow the delivery of the material more focused. The structure of this media begins with introductory questions. These introductory questions are found on only a few slides. After the initial section, the next slide explains each digestive organ sequentially starting from the mouth, esophagus, stomach, small intestine, large intestine, and anus. Each slide only focuses on one organ to avoid student confusion, while also making it easier for teachers to explain the material slowly. Figure 2. Presenting the initial display of the explanation of organs and their functions:

Figure 2. Initial view of the digestive organ slide

Each organ is explained using simple language and lists its essential functions. The organ functions are deliberately kept concise so elementary school students can grasp the core of the material without being burdened with overly complex scientific terms. For example, the small intestine slide explains that this organ functions to absorb nutrients from food, while the stomach slide explains that the stomach is responsible for grinding food. Simple explanations like these help correct common misconceptions, such as the assumption that food is immediately absorbed by the body after chewing or that the stomach is merely a storage area for food without further processing. In addition to explaining the organs and their functions, this media also provides five types of digestive system disorders that are close to students' lives, typhus, diarrhea, Gastroeshopageal Reflux Disease (GERD), thrush, and ulcers. The inclusion of this digestive disorder material has two goals: to provide additional insight to students and to help them distinguish between normal organ function and conditions when organs experience problems. Each disorder is explained in a separate slide with static, child-friendly animated images. The explanation includes the causes of age and common symptoms experienced. This delivery is delivered in a light-hearted style so that students understand the core information. The overall visual appearance of the media is designed to be cheerful yet informative. The use of bright colors, animated illustrations, and consistent images supports students' understanding where they need the help of images to imagine processes that cannot actually be seen directly. Figure 3 presents a display of disorders of the digestive system:

Figure 3. Initial appearance of digestive system disorders

This one-click slide transition adds practicality. Teachers can control the flow of the lesson without having to operate numerous buttons or animation effects. This presentation style combines engaging visual elements with material containing important concepts without overwhelming students. This medium is expected to be widely used in both public and private elementary schools as an effective learning tool for Natural Sciences.

Product Validity

This stage is carried out to determine the validity of the product. The instrument used to validate a product is known as a validation sheet. Validation is the process of ensuring that a system or process truly functions according to its purpose and is a very important subject in various fields, one of which is product development (Nursyami, 2023). This is in line with research conducted by (Rahmawati, 2022) which states that the validation process for a product is very necessary so that the product developed has feasibility, content suitability, and can be used properly by users. In this study, the validation process was carried out by two validaters: a media expert lecturer and a material expert who are both lecturers from the Faculty of Teacher Training and Education, Muhammadiyah University of Surakarta, who were selected according to their expertise in their academic track record.

A validation sheet is a document or form used to collect data and information related to the validation process of a product, method, or instrument. In the context of research or development, validation sheets are often used to evaluate the effectiveness or suitability of a product or tool for a specific purpose or standard. This is in line with (Syaitika & Fauziah., 2023) which shows that validation sheets have been widely used in various development studies. Validation sheets aim to ensure that research instruments can accurately measure what is intended to be measured. This media validation was carried out by Ms. Meggy Novitasari, S.Pd.M.Pd., while material validation was carried out by Mr. Mazwar Ismiyanto, M.Pd. so that the developed product can be tested for its feasibility, a validation test is carried out. From the validation test according to media experts, there are 14 assessment indicators which include: 1. Display design, 2. Layout of elements, 3. Color selection, 4. Transitions between pages, 5. Language used, 6. Media can be used to minimize misconceptions, 7. Media information helps understanding concepts, 8. Media is used without technical constraints, 9. Media is not damaged, 10. Features are safe for students to use, 11. Media can be used repeatedly, 12. Media shows new ideas, 13. Media combines elements of technology creatively, 14. Media has the potential to be developed further. The results of media validation carried out by media experts obtained a total value of "66". When converted referring to the formula, the results obtained were 94.28%, with the criteria "Very Valid". Validation according to material experts based on assessment indicators totaling 11 assessment aspects: 1. The material is in accordance with the independent curriculum, 2. The material is in accordance with learning outcomes, 3. The material is in accordance with learning objectives, 4. The concept of the material does not cause misconceptions, 5. The material can minimize the possibility of misconceptions, 6. The material is from simple to complex, 7. The material is linked to real phenomena, 8. Media examples are in accordance with everyday experiences, 9. Language is easy for students to understand, 10. Simplicity of sentence structure, 11. Language suitability with PUEBI. The results of media validation carried out by material experts obtained a total value of "50" when converted which refers to the formula gets a result of 90.90%. So it can be concluded that the results of the material validation can be said to be included in the "Very Valid" criteria. There is input from experts, namely adding several incomplete sentences in the digestive disorders material. Based on all the results of the assessment by media experts and material experts, it can be concluded that the digital pop up book media developed has met the valid criteria. This media is proven to be able to attract students' interest in learning by presenting content visually and interactively,Including animated features that enhance the material's appeal and support deeper understanding. This aligns with previous research conducted by Wulandari et al. (2023), which emphasized the importance of interactive learning media in motivating students and fostering learning interest. Research by Yulianti (2022) also supports these findings, revealing that the use of animated learning media has a positive impact on student

interest and learning outcomes..This media is ready to be used as supporting teaching material in science lessons on the human digestive system. Its high validity indicates that this media is also a suitable alternative learning tool, helping students understand concepts in a coherent, simple, and engaging manner. With appropriate animations and accurate explanations, this media has the potential to provide a more meaningful learning experience for elementary school students.

Practicality of the product

The practicality of a digital pop-up book on the human digestive system was analyzed to determine its ease of use, understanding, and support for classroom learning. This assessment was conducted using a practicality questionnaire completed by teachers after directly viewing, reviewing, and evaluating the media. Thus, the practicality obtained was the result of teachers' observations and assessments of the media's features, appearance, structure, and ease of use.

Based on the results of teacher assessments for assessment indicators totaling 12 assessment aspects that include: 1). Media can be used to visualize material about the digestive system. 2). Media helps in the learning process to make it easier for teachers to convey complex concepts in a simpler, more interesting, and directed way, 3). Digital Pop-Up Media presents a multisensory learning experience through a combination of visuals, text, and animation. This experience makes it easier for students to remember the digestive process because they not only see, but also understand the sequence of processes through displays that resemble real pop-ups. This creates a strong and long-lasting learning memory, 4). Media can minimize misconceptions in students because Digital Pop-Up Book Media presents precise illustrations and is in accordance with scientific concepts so that it helps correct erroneous understandings, 5). Easy to prepare before learning. Files only need to be opened using devices such as laptops or LCD projectors. Because it is only an interactive PowerPoint, the installation and access process is very simple so that the media can be used immediately without complicated setting stages. This is in line with research (Kurniaty, 2020) which revealed that PowerPoint is a type of software specifically designed to display multimedia programs in an attractive, easy-to-create, easy-to-use, and relatively inexpensive way because it does not require raw materials other than data storage devices, therefore, teachers do not need to install other applications on their computers or laptops because the basic applications are already available on every computer. In this study, the digital pop-up book developed was based on interactive PPT without any special installation process. Thus, it can be assumed that the use of this digital pop-up book media will not be an obstacle in operating it in the classroom. 6). The media is easy to operate which is designed with a simple display and intuitive navigation. Its operation only requires a click to move slides. Teachers and students do not require special technological skills thus minimizing technical obstacles during learning, 7). The media can be used repeatedly without experiencing significant damage. Unlike conventional pop-up media which is susceptible to damage, the digital version can be used repeatedly without tears, folds, or other physical damage. As long as the file is stored properly, the media can still be used in many meetings or the next school year, 8). Media can be used in allocating learning time. Each slide displays information that is not excessive, so that teachers can manage explanation time optimally without making the lesson too long. 9). Media can be used by students with minimal guidance from the teacher. The user-friendly media display allows students to explore the material independently.Students can understand the contents of the slides directly through clear visuals and simple explanatory language 10). In the aspect: "Media can help students understand the concept of the material more deeply" seen in the relationship between organs in animative form, students will more easily understand the digestive process as a whole. This is reinforced by research (Putri et al., 2024) which reveals that digital pop-up book media is also an innovative alternative to enrich students' learning experiences and support the improvement of critical thinking skills through a visualization approach and contextual concept exploration. The pop-up book media developed in this study is very relevant for use in elementary school science learning because the pop-up visualizations and dynamic simulations presented are able to present simulations that resemble the actual process. This not only makes students more interested, but also helps them build correct conceptual understanding from the early stages of learning. 11). The media does not cause technical difficulties that interfere with the learning process. This reduces the risk of technical problems such as lag, application crashes, or heavy devices 12). Media can help students to be actively involved in the learning process with an attractive visual display that encourages students to ask questions, discuss, and provide responses. The results of the practicality of the media carried out by the homeroom teacher of grade V elementary school obtained a total value of "55". When converted referring to the formula, the results obtained were 91.66%, with the criteria of "Very Practical." This is in line with the findings (Islami et al., 2024) which state that learning media that combine elements of interactivity and visualization are able to create a fun learning experience and encourage active student involvement. Thus, the Digital Pop Up Book media can be categorized as a practical media and is suitable for use in science learning in elementary schools (Dandung et al., 2023).The media does not cause technical difficulties that disrupt the learning process. This reduces the risk of

technical problems such as lag, application crashes, or heavy devices 12). Media can help students to be actively involved in the learning process with an attractive visual display encouraging students to ask questions, discuss, and provide responses The results of the practicality of the media carried out by the fifth grade elementary school homeroom teacher obtained a total value of "55". When converted referring to the formula, the result is 91.66%, with the criteria "Very Practical." This is in line with the findings (Islami et al., 2024) which state that learning media that combine elements of interactivity and visualization are able to create a fun learning experience and encourage active student involvement. Thus, the Digital Pop Up Book media can be categorized as a practical media and is suitable for use in science learning in elementary schools (Dandung et al., 2023).The media does not cause technical difficulties that disrupt the learning process. This reduces the risk of technical problems such as lag, application crashes, or heavy devices 12). Media can help students to be actively involved in the learning process with an attractive visual display encouraging students to ask questions, discuss, and provide responses The results of the practicality of the media carried out by the fifth grade elementary school homeroom teacher obtained a total value of "55". When converted referring to the formula, the result is 91.66%, with the criteria "Very Practical." This is in line with the findings (Islami et al., 2024) which state that learning media that combine elements of interactivity and visualization are able to create a fun learning experience and encourage active student involvement. Thus, the Digital Pop Up Book media can be categorized as a practical media and is suitable for use in science learning in elementary schools (Dandung et al., 2023).

Conclusion

Based on the results of research and development that have been carried out, it can be concluded that the Digital Pop-Up Book media on the human digestive system material for fifth grade elementary school students is declared suitable as a science learning medium that can minimize student misconceptions as follows: 1). This media is arranged with an attractive 2D visual display of static illustrations, as well as simple animations through the Canva and PowerPoint platforms, so that it is able to present material in a coherent, concrete, and easy to understand manner for elementary school students. 2). The results of the validity test show that the media obtained a Very Valid category, namely 94.28% from media experts and 90.90% from material experts. This means that the content, visual appearance, presentation structure, depth of material, and language aspects of the media have met the eligibility standards and do not cause misconceptions. 3). The practicality test obtained a score of 91.66% with a Very Practical category, which indicates that the media is easy to use, easy to operate, can be understood without technical constraints, and helps teachers in conveying abstract concepts more simply, interestingly, and directed. Thus, the developed Digital Pop-Up Book is not only suitable for use on a wider scale by first establishing a hypothesis to test its effectiveness in increasing student engagement, and reducing misconceptions in elementary school science learning.

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References

Aini, L. N., & Guntur Nurcahyanto, S. T. (2025). Development of Augmented Reality (AR)-Based E-Flashcard Media in Biology Learning on the Digestive System for Grade XI (Doctoral dissertation, Muhammadiyah University of Surakarta).

Anggraini, I. D., & Sutama, M. P. (2023). Development of an Android-Based Augmented Reality Application as a Learning Medium for Introduction to the Solar System for Elementary School Children (Doctoral dissertation, Muhammadiyah University of Surakarta)

Apriani, P. E., Giri, I. M. A., & Primayana, K. H. (2025). Development of Pop Up Book Learning Media with a Contextual Approach in Science Subjects for Fifth Grade Elementary School Students. Journal of Elementary School Teacher Education, 2(4), 12-12.

Atikasari, Y., & Desstya, A. (2022). Analysis of the need to develop pop-up book learning media based on scientific literacy on the human digestive system for grade V of elementary school. Basicedu Journal, 6(4), 6638-6645.

Desstya, A., & Razzaq, A. A. (2023). Development of Learning Media for the Material of Reproduction of Living Things as an Alternative Learning Media in Elementary Schools. Elementary: Scientific Journal of Elementary Education, 9(2), 90-99.
Dias, S. (2025). Development of digital-based pop-up book media to improve critical thinking skills on the earth and the universe. Journal of Elementary School Teacher Education Research, 13(6), 1516-1528.
Erica, S. (2021). Development of pop-up book media in civics learning in elementary schools. Ability: Journal of Education and Social Analysis, 110-122.
Fauziyah, D. H., & Mulyani, P. K. (2024). Development and evaluation of a digital pop-up book on the concept of force for fourth-grade science. Journal of Science Education Research, 10(7), 3721-3730.
Febriyanti, R. A., & Sulistyawati, I. (2024). Application of digital pop up book media in Pancasila education learning on Bhinneka Tunggal Ika material for fourth grade elementary school students. Journal of Elementary School Teacher Education, 1(3), 10-10.
Indrajatun, D. A. R., & Desstya, A. (2022). Analysis of misconceptions on human digestive system material using certainty of response index in elementary schools. Basicedu Journal, 6(4), 6345-6353.
Magfirah, R. (2025). THE APPLICATION OF DIGITAL POP-UP BOOK MEDIA ON THE LEARNING OUTCOMES OF GRADE 5 STUDENTS OF MAWANG CENTRE STATE ELEMENTARY SCHOOL, GOWA REGENCY. Didactics: Scientific Journal of PGSD STKIP Subang, 11(03), 352-361.
Nabila, S., Adha, I., & Febriandi, R. (2021). Development of pop-up book learning media based on local wisdom in thematic learning in elementary schools. Jurnal basicedu, 5(5), 3928-3939.
Ningrum, A. P., Lestari, B. P., Laili, I. N., & Nugraheni, Q. A. J. (2025). DEVELOPMENT OF LOCUS ADVENTURE POP-UP BOOK MEDIA TO IMPROVE STUDENTS' LEARNING INDEPENDENCE. FIBONACCI: Journal of Mathematics and Mathematics Education, 11(1), 55-64.
Pongkendek, J. J., & Kristyasari, M. L. (2022). The Use of Two-Tier Multiple Choice for Analyzing Student Misconceptions. Quantum: Journal of Science Education Innovation, 13(1), 131-139.
Ramdan, M., & Anita, I. W. (2024). The Development of Interactive Powerpoint Learning Media to Increase Students' Critical Thinking Ability. *(JIML) JOURNAL OF INNOVATIVE MATHEMATICS LEARNING*, *7*(3), 252-261.
Rosid, D. P. S., Desstya, A., & Sumardjoko, B. (2024). DEVELOPMENT OF THE APPLICATION "Puppet Story of the Proclamation Moments" BASED ON GADGETS FOR ELEMENTARY SCHOOL STUDENTS. FIKRUNA: Scientific Journal of Education and Society, 7(1), 333-350.
Saputri, D., Mellisa, M., Hidayati, N., & Fauziah, N. (2023). Validation Sheet: An Instrument Used to Assess Products Developed in Educational Development Research. Biology and Education Journal, 3(2), 133-151.
Sekarsari, A., & Maharani, S. D. (2025). Development of Digital Pop-Up Book Media in Pancasila Education Learning on Indonesian Social and Cultural Diversity Material for Grade III SDN 12 Sembawa. Papeda Journal: Journal of Elementary Education Publication, 7(2), 244-252.
Simatupang, A. F., Ananda, L. J., Irsan, I., & Nasution, Y. (2025). Analysis of Elementary School Students' Misconceptions Using the Two-Tier Multiple Choice Test Method in Science Learning. Pedagogik Journal of Islamic Elementary School, 1-12.
Suwanto, N. D., & Desstya, A. (2024). Development of Science Learning Videos on Single Substances and Mixed Substances Based on Local Wisdom in Sragen Regency. ELSE (Elementary School Education Journal): Journal of Elementary School Education and Learning, 8(1).
Sholiha, M. A., Syamsi, A., & Atikoh, N. (2025). Development of Digital Pop Up Book Media to Improve Students' Communication Skills in Elementary School Science Subjects. Journal of Humanities, Social Sciences, and Education, 1(5), 132-145.
Wulandari, D. T., & Sayekti, I. C. (2022). Analysis of Card Media Development Needs on QR-Code Based Ecosystem Material for Elementary School Students. Basicedu Journal, 6(4), 6428-6436.
Yuliani, S. M. I., & Hidayat, T. (2025). Development of Digital Pop-Up Book Media with Local Content from East Kalimantan for Grade V Science Material. JANACITTA, 8(2), 405-413.