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# Development of Teaching Materials Assisted by Book Creator in IPAS Material Subject of the Human Respiratory System to Improve Learning Outcomes for Grade V Elementary School

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**Abstract**

**Background:** The lack of interesting and interactive teaching materials in IPAS learning in elementary schools leads to low motivation and learning outcomes of students. Teaching materials that are still dominated by textbooks have not been able to accommodate diverse learning styles.
**Aims:** This study aims to develop interactive teaching materials supported by the Book Creator application to enhance the learning outcomes of fifth-grade students on the topic of the human respiratory system
**Methods:** This research employed the Research and Development (R&D) method utilizing the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. Data were collected through validation questionnaires, student response surveys, learning outcome tests, and interviews.
**Result:** The developed teaching materials received a "Very Good" category from media, material, and language expert validators. Students' learning outcomes increased from 53.3% (pre-test) to 90% (post-test) after using teaching materials.
**Conclusion:** Teaching materials assisted by Book Creator are feasible, practical, and effective in increasing students' understanding and learning motivation on the material of the human respiratory system.

## A. Introduction

Learning is a relatively lasting change in behavior resulting from experience, observation, and interaction with the environment (Dayanti et al., 2023). In behavioristic learning theory, a person is considered to have learned if he is able to show changes in behavior (Huda et al., 2023). In learning activities that occur in the school environment, teachers are an important component in supporting the success of the learning process of students. As the main facilitator, the teacher has a great responsibility in creating conditions that support the learning process of students. Teachers need to understand various types of media and teaching materials and their functions, have skills in designing a medium, and can utilize various sources (Fatmawati, 2021). In addition, teachers also need to have a good understanding of choosing teaching materials that are relevant and in accordance with the needs of students.

Teaching materials have a significant role in supporting the learning process (Tanjung & Fahmi, 2024). Teaching materials are used as one of the media that are systematically arranged to facilitate students in

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independent learning and aim to achieve targeted competencies. Engaging teaching materials that meet students' needs can enhance conceptual understanding and improve learning outcomes. The vital role of teaching materials in supporting learning requires teachers to be more creative and innovative in choosing and using them, so that they can adapt to the characteristics and needs of students.

Based on observations made at SDN Lawanggintung 2, Bogor City, most students are less enthusiastic about learning, especially in IPAS learning, due to teaching materials dominated by teacher books and student books. In reality, the teacher and student textbooks provided by the current government have not yet functioned as interactive media, as they are limited to text and images (Prastyana et al., 2023). Previous research on IPAS subjects at SDN Pakis 5 Surabaya showed that learning was still dominated by conventional methods using printed teaching materials that were less interactive (Qomara et al., 2024). This has impacted students' average learning outcomes, which remain suboptimal, and has contributed to a lack of interest and motivation among students in engaging with the learning process. Interviews with the fifthgrade homeroom teacher also showed that in the IPAS learning material on the respiratory system, students need a more interactive visual explanation so that the explanation of concepts is easier to understand and more realistic. Learners need concrete teaching materials supported by interactive teaching materials to make it easier for students to understand learning concepts to be more easily understood. Integration of technology in learning can help learners understand complex concepts better (Fitrianna et al., 2022). The integration of technology in education highlights the importance of having instructional media available for both online and offline use (Candrasari et al., 2023).

In line with the rapid advancement of technology, a wide variety of teaching materials are now available to serve as learning resources for students.. Integrating media into the learning process serves as an effort to enhance the quality and relevance of instruction (Pahlifi & Fatharani, 2019). Teaching materials can be classified into four categories, namely printed teaching materials, listening teaching materials, video teaching materials, and interactive video teaching materials (Wafi & Agustina, 2023). Teachers are encouraged to use engaging learning media to capture students' attention during lessons, making it easier for students to understand the material being taught. (Hayyuna et al., 2023) Interactive teaching materials represent one of the innovative approaches that can be further developed among the various teaching materials. Moreover, compared to traditional teaching methods in elementary schools, the implementation of digital technology yields a positive, though modest, effect on cognitive and non-cognitive learning outcomes (Vanbecelaere et al., 2023).

Interactive teaching materials integrate various forms of learning media such as audio, video, text, and graphics and facilitate two-way interaction between the content and its users. Interactive teaching materials can involve students actively in activities (Dewi et al., 2022). In addition, by combining various media, interactive teaching materials can support different learning styles for each learner. Integrating e-learning as a medium for Science instruction aims to foster a more interactive and engaging learning environment, ultimately supporting and enhancing students' academic achievement (Freddy & Olifia, 2019). If learners receive lessons that match their learning style, the lessons will be easier to understand (Supit et al., 2023).

Learning media in of electronic books (e-books) can serve as an alternative to enhance students' learning motivation. One of the supporting applications that can be utilized in making interactive teaching materials is Book Creator. With their engaging design, e-books can boost motivation and help students better understand the learning materials provided (Falah et al., 2021). Book Creator is web software that can facilitate the creation of interactive and attractive digital teaching materials. Users can easily integrate diverse content, such as images, videos, links, and other files, into compiled teaching material (Nisa et al., 2024). The Book Creator feature also allows adding audio recordings (Nikawanti et al., 2024). In addition, the Book Creator application can also be collaborated with several applications such as Canva, Bitmoji, Giphy, Google Drive, and other applications (Nisa et al., 2024). Integrating Book Creator with Canva can significantly enhance the visual appeal and interactive video integration of digital learning materials, making them more aligned with the characteristics of students. This synergy allows for creating engaging and visually rich content that caters to diverse learning styles (Nurlaila et al., 2025). Therefore, this Book Creator application supports the development of interactive teaching materials. Book Creator is accessible to students across various devices, including laptops, tablets, and mobile phones. The integration of media through tablets or smartphones can significantly bolster students' self-efficacy, cultivating confidence in their technological skills and fostering independent learning when utilizing these devices (Sun & Jiang, 2015).

Previous studies on the development of digital teaching materials supported by the Book Creator application indicate that the use of digital materials has successfully improved the learning outcomes of fifth-grade

students at SDN Pakis 5 Surabaya in the IPAS subject (Qomara et al., 2024). Other research on developing interactive teaching materials assisted by the Book Creator application with the Problem-Based Learning Model shows a very valid category and an increase in students who get scores above the KKM (Nisa et al., 2024). Other research on the development of E-books assisted by Book Creator on Human Blood Circulatory System material to improve the learning outcomes of grade V elementary school students shows results that are quite effective in improving student learning outcomes, and the E-Book developed is feasible and very practical to use (Madina & Zulherman, 2023).

While Book Creator has seen extensive implementation in various learning contexts, existing literature reveals a significant research gap concerning its specific utilization as a teaching material for the respiratory system topic among fifth-grade elementary school students within the framework of the Merdeka Curriculum**.** Consequently, the novelty of this research lies in the development and validation of interactive teaching materials specifically designed using Book Creator for this particular topic, aiming to provide empirical and practical contributions regarding the effectiveness of this medium in improving learning outcomes for this specific subject matter and educational level.

Teaching materials assisted by Book Creator can be used as an alternative teaching material that can be used to show a more effective learning process in improving student learning outcomes. In light of this, the researcher is motivated to conduct a study entitled "Development of Teaching Materials assisted by Book Creator to improve the learning outcomes of grade V elementary school".

## B. Research Methods

1. Type of Research

This type of research employs research and development methods, commonly referred to as Research and Development (R&D). This R&D research is a study whose result is to create a new product or develop existing products into new products that are better and more perfect. The researchers developed a product in the form of teaching materials supported by the Book Creator application, focusing on the Respiratory System topic within the IPAS material, aimed at improving the learning outcomes of fifth-grade elementary students. The research design model utilized in this study is the ADDIE research and development model, which includes Analysis, Design, Development, Implementation, and Evaluation.

2. Sample or Object of Research

The subjects in this study were fifth-grade students of SDN Lawanggitung 2 and involved three validators: material experts, media experts, and linguists. All three play a role in validating the material's content, language, and quality of the teaching materials developed.

3. Time of Research

This research was conducted from March to April 2025.

4. Research Procedures

The steps of research and development of teaching materials were carried out using the ADDIE steps, namely:

a. Analysis Stage

At this stage, an analysis of the needs of the learning media to be developed is carried out, so that the products that will be produced are suitable and meet the needs of the target. The analysis at this stage includes needs analysis, school facilities analysis, and subject analysis. This stage is carried out by conducting field observations of the problems in learning activities and by knowing the facilities and infrastructure owned by the school.

b. Design Stage

At this stage, researchers will design teaching materials tailored to the results of the first analysis stage. Activities in designing this teaching material include: (1) determining learning objectives; (2) preparing material maps; (3) selecting media formats; (4) designing visual displays; (5) making storyboards or initial drafts.

*c.* Development Stage

An this stage, the design that is still in the form of a concept will be developed and realized to become a product that is ready to be implemented through several stages of validation from several

experts, namely, media experts, material experts, and linguists The purpose of conducting assessments from several experts is to determine and measure the quality of products that will and have been developed. The data obtained from these experts will serve as a basis for refining and enhancing the quality of the teaching materials to be developed by the researchers.

d. Implementation Stage

At this stage, the application of the results of the design of teaching materials that have been developed begins. After being declared valid and feasible by experts, the teaching materials are applied in teaching and learning activities at school as a form of field trials. The trial was carried out in one 2JP learning meeting, involving grade V students as the test subjects. Before learning begins, students are given a pre-test to measure their initial knowledge of the material to be learned. During the learning process, students use the teaching materials that have been prepared to understand the material presented.

e. Evaluation Stage

After the entire learning session, students were given a post-test to measure the increased understanding and the effectiveness of using teaching materials. In addition, students were also asked to fill out a questionnaire to evaluate of the practicality, ease of use, and attractiveness of teaching materials. Data from the pre-test and post-test were then analyzed to determine the effectiveness of the teaching materials. At the same time, the questionnaire results were analyzed to evaluate the level of practicality. Feedback obtained from students is an important consideration in revising and improving teaching materials, so that they are more optimal in supporting the learning process in the future.

5. Data Collection Techniques

The data in this study were obtained through several techniques, namely questionnaires, learning outcomes tests, and interviews. Questionnaires were used to obtain expert assessments, and student responses, learning outcomes tests, and interviews were utilized at the needs analysis stage. Meanwhile, learning outcomes tests and interviews were utilized at the needs analysis stage. The collected data were then further analyzed.

6. Research Instruments

Instruments are tools or means used in research to collect data, so that the work process becomes more efficient and the results are more accurate and easier to analyze. This study used several types of instruments, including validation sheets, questionnaire sheets, interview guides, and test questions. The validation sheet is used to evaluate the quality of the media, material and language of the teaching materials developed, The student response questionnaire is used to assess the extent to which the media is engaging, user-friendly, and facilitates their understanding of the material, the interview guide to explore the needs and expectations of students and teachers for the learning media developed. At the same time, the test questions are 20 items to measure the achievement of student learning outcomes after using learning media.

7. Analysis Plan

7.1 Media Feasibility Analysis

To determine the level of media feasibility that has been developed based on the assessment of material and media experts, the following formula is used:

$$\underline{x} = \frac{\sum I}{n} \; x \; 100$$

Information:

$\underline{x}$= Average Score
$\sum I$= Total Cxcore
$n$= Number of items

The results of this average calculation will be further analyzed by referring to the assessment interpretation criteria to determine the media feasibility category, which can be seen in Table 1 below :

**Table 1.** Media Quality Criteria

| Score | Category |
|---|---|
| 75%<x<100% | Excellent |

| Score | Category |
|---|---|
| 50% < x < 75% | Good |
| 25% < x < 50% | Average |
| 0% < x < 25% | Poor |

7.2 Practicality of Learning Media

The practicality of the media is obtained from the results of student response questionnaires that used a Likert scale consisting of 5 categories in Table 2:

**Table 2.** Scoring of Student Response Questionnaires

| Criteria | Score |
|---|---|
| Strongly agree | 5 |
| Agree | 4 |
| Neutral | 3 |
| Disagree | 2 |
| Strongly disagree | 1 |

Furthermore, the average score for each item statement is calculated, then converted into a value on a five-point scale. By using the following formula:

$$R = \frac{x}{n} x\ 100\%$$

Information :

R = average percentage of chosen answers

$x$= total percentage of each question

$n$= number of questions

The average score data is then converted into a qualitative data scale, which is shown in the table as follows:

**Table 3.** Criteria for Student Response Questionnaires

| Score | Category |
|---|---|
| 75%<x<100% | Excellent |
| 50% < x < 75% | Good |
| 25% < x < 50% | Average |
| 0% < x < 25% | Poor |

7.3 Media effectiveness analysis

Data on media effectiveness is obtained through the results of written tests given after the use of learning media, using the formula:

$$p = \frac{n}{N} x100\%$$

Information:

$p$ : learning completion percentage

$n$ : number of students who completed

$N$: Total students

To evaluate the effectiveness of the developed learning media, the researchers utilized a percentage scale based on student learning completion criteria, as outlined in Table 4:

**Table 4.** Percentage Mastery Learning

| Percentage of students who completed | Category |
|---|---|
| $p \geq 80\%$ | Excellent |
| $60\% < p \leq 80\%$ | Good |
| $40\% < p \leq 60\%$ | Average |

| Percentage of students who completed | Category |
|---|---|
| 20 % < $p$ ≤40 % | Poor |
| 0% < $p$ ≤20% | Bad |

The subsequent analysis involves comparing learning outcomes before (pre-test) and after (post-test) using the developed teaching materials. The collected data, namely pre-test and post-test scores, will be analyzed using their respective average values. This comparison employs the N-Gain score, also known as the normalized gain test.

8. Scope and/or limitations of the research used.

8.1 Scope

The material development in this study focused on the topic of the human respiratory system in the IPAS subject. The method used is research and development (R&D) using the ADDIE model, which includes five stages: analysis, design, development, implementation, and evaluation. The final product is an interactive digital teaching material made with the Book Creator application, then validated by experts in the fields of material, media, and language, and tested in a limited number of fifth-grade students.

8.2 Limitation

This research has several limitations, including:

1. Narrow area coverage was only implemented in one primary school, so the results cannot be generalized to other schools or a wider area.
2. The number of trial participants was limited, involving a small number of grade V students as research subjects.
3. The material focuses only on the human respiratory system, so the effectiveness of this teaching material compared to other IPAS materials is unknown.
4. The short duration of the research implementation, which only took place from March to April 2025, made it impossible to observe the long-term impact on student learning outcomes.

## C. Results and Discussion

### 1. Results

This study aims to develop application-assisted teaching materials for learning the IPAS respiratory system material in fifth-grade elementary school. The research used the ADDIE development model, encompassing analysis, design, development, implementation, and evaluation stages.

### 1.1 Requirement Analysis

The requirements analysis for developing this product is based on the findings from interviews with mentor teachers and fifth-grade teachers at SDN Lawanggintung 2 Bogor. The results of these interviews indicate that the teaching materials, which still use school textbooks from the government and other teaching materials, need to be improved to increase students' insight. Limited learning resources for books alone so that if there are teaching materials that can show from science subject which is the process of the respiratory system directly with attractive colors and are easily accessible by all teachers and students, it is expected to improve learning outcomes and also motivation for students. Teaching materials that are only in the form of text also do not accommodate the interests and learning styles of each learner, so teaching materials that can accommodate audio and visual will be needed at the elementary school level. Based on the following factual interview data, the development of interactive teaching materials is needed, one of which is interactive e-books. E-books supported by various multimedia sources (such as videos and interactive elements) can increase student engagement and interactivity in the learning process (Tlili et al., 2022). This is reinforced by research from (Chen et al., 2024), which found that interactive e-books containing gamification elements and self-regulated strategies significantly improved primary students' motivation, academic performance, and metacognition. In addition, Sujanem & Suwindra (2023) revealed that problem-based interactive e-modules can improve critical thinking skills, showing the benefits of including interactive quizzes and multimedia explanations.

The content of the developed teaching materials focuses on the topic of the Respiratory System ithin the IPAS material, covering the organs of the respiratory system, how the respiratory system works, respiratory system diseases to how to avoid or treat diseases of the respiratory system. In addition to learning materials, there are video illustrations of each respiratory organ working with audio and text explanations, along with interactive quizzes. The media used in the learning process should be able to adapt to various learning styles of students and be in line with technological developments (Wuarlela, 2020). It is hoped that the learning outcomes that were obtained could be increased.

### 1.2 Design Phase

In this phase, the design collection is carried out using the Canva application as follows:


**Figure 1.** Canva Design

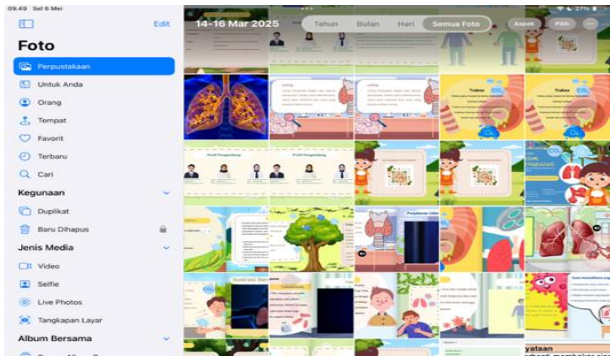


**Figure 2.** Set of Design Results

Teaching materials are designed using the Canva application and will be made into a PNG picture format. The animated video of the organs of the respiratory system will be created in the MP4 video format.

### 1.3 Development Phase

In this phase, teaching materials are developed using the Book Creator application by entering all designs, images, and videos, which will then be added to the sound and instruments. The audio is recorded directly in the Book Creator application, and sound editing is done to make it clearer and better.

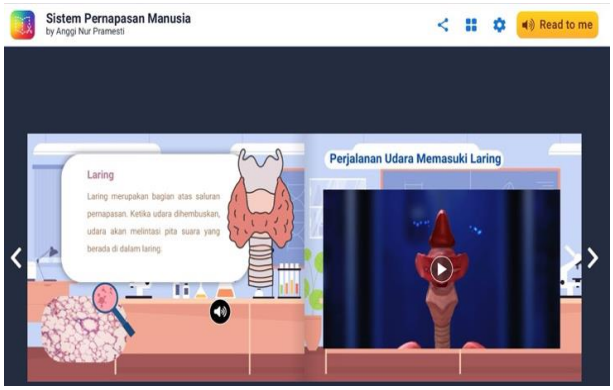


**Figure 3.** Adding audio in the Book Creator application

After the entire design is neatly arranged and audio and video are added, the next step is to publish teaching materials digitally. The goal is to make teaching materials easily searchable on search engines like Google. The final form of teaching materials is a link that can be shared with students or directly searched for teaching materials for the respiratory system independently on search engines.

In this phase, the teaching materials are also validated. Validation is collecting data from experts in their fields to validate and invalidate teaching materials. The results of this validation also aim to get input on audio-visual teaching materials that will be applied. Three validators from Pakuan University lecturers conducted the product validation. The validation method is obtained from an assessment questionnaire. In addition to providing an assessment, validators also provide criticism and suggestions for the development of products. Validation was carried out 2 times until the teaching materials were declared suitable for use without revision.

**Media Expert**

The result of validation from the validator for teaching materials from the Book Creator Application can be seen in Table 5.

**Table 5.** Media Expert Validation Result

| No. | Assessment Aspect | Score (%) | Category |
|---|---|---|---|
| 1. | Content Relevance | 90% | Very Good |
| 2. | Design & Presentation | 95% | Very Good |
| 3. | Learning Effectiveness | 93,33% | Very Good |
| 4. | Practical & Technical Aspects | 90% | Very Good |
| 5. | Overall Quality | 90% | Very Good |
| | Average | 91,66 | Very Good |

Based on the initial validation results of the instructional material by media experts, with revisions made to achieve maximum scores, the suggested improvements for the instructional material include: 1) The media display is too plain, making it less suitable for the characteristics of elementary school students. 2) Adding musical instruments to the instructional material increases students' learning motivation at the beginning of using the material. 3) Including QR code material at the end of the media for students' Formative Assessment. The instructional material has undergone improvements and re-validation, achieving an average aspect score of 91,66 with very good criteria to be tested in grade V elementary school.

**Language Expert**

Validation results from linguist validators of teaching materials assisted by the Book Creator application can be seen in Table 6.

**Table 6.** Language Expert Validation Result

| No. | Assessment Aspect | Score (%) | Category |
|---|---|---|---|
| 1. | Language Appropriateness and Accuracy | 93,33% | Very Good |
| 2. | Clarity and Understandability | 95% | Very Good |
| 3. | Suitablility for Developmental stage | 95% | Very Good |
| 4. | Linguistic Effectiveness | 90% | Very Good |
| | Average | 93,33 | Very Good |

Based on the results of linguist validation, with revisions to achieve maximum assessment. Teaching material improvements include 1) Correcting the title writing on the front cover, 2) Adding the product identity “teaching materials” and logo. 3) Correcting the writing rules in each section. Teaching materials have been improved and revalidated. The validation obtained is 93,33, and the criteria are very good for testing in the fifth grade.

**Material Expert**

The alienation results from the material expert on teaching materials, assisted by the Book Creator application, can be seen in Table 7.

**Table 7.** Material Expert Validation Result

| No. | Assessment Aspect | Score (%) | Category |
|---|---|---|---|
| 1. | Alignment with Developed Teaching materials | 100% | Very Good |
| 2. | Appropriateness for student level | 90% | Very Good |
| 3. | Depth of material | 80% | Very Good |
| 4. | Quality of Learning Material | 90% | Very Good |
| | Average | 90 | Very Good |

Initial expert material validation revealed the necessity for several revisions. 1) Misconception of the pharynx in the respiratory system, 2) Learning outcomes are outlined, 3) Writing learning objectives added with respiratory system diseases, along with prevention and treatment solutions. 4) Adding two new bibliographies and reading references in Chambel's book. Teaching materials have been improved and revalidated, with an average of 90 and very good criteria for testing in elementary schools.

### 1.4 Implementation Phase

In this phase, teaching materials were trialed on grade 5 students of SDN Lawanggintung 2, Bogor. The research findings indicate a significant increase in student responses from the pre-test to the post-test. A comparison of the pre-test and post-test scores, along with the N-gain calculation results, can be seen in the table and graph below:

**Table 8.** Mean test score

| Test Phase | Average Score |
|---|---|
| Pre-test | 5,75 |
| Post-test | 8,36 |

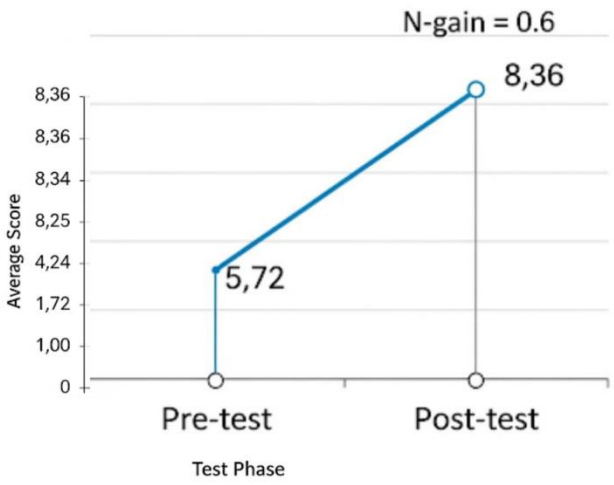


**Figure 4.** N Gain

The study's finding reveal a subtantial improvement in student learning outcomes following thw instructional intervention. A detailed comparison of the average pre-test and post-test scores, alongside the calculated N-gain, is visually represented in the accompanying graph. As depicted in the graph, the students' average score on the pre-test was 5.72. A notable increase was observed after implementing the teaching materials, with the average post-test score rising to 8.36. This upward trend clearly suggests a beneficial impact of the instructional materials on students' comprehension.

A normalized N-gain calculation was performed to assess the intervention's efficacy comprehensively. The resulting N-gain value was found to be 0.6. This figure places the intervention within the "medium gain" category, indicating that the applied teaching materials were moderately effective. This effectiveness is evident in their capacity to bridge the gap between students' initial abilities (pre-test) and their potential maximum performance, thereby significantly enhancing learning. Furthermore, the overall research data

shows that the student pass rate, after utilizing these teaching materials, reached an impressive 90%, further underscoring the intervention's demonstrated effectiveness.

### 1.5 Evaluation Phase

In this phase, teaching materials are revised based on the feedback and changes to improve the quality of the teaching materials. At this stage, checking is also carried out at all stages from problem analysis, design and validation and revision to the implementation phase.

## 2. Discussion

The results of this study prove that the development of digital teaching materials by utilizing Book Creator is effective in improving student learning achievement and obtaining excellent assessments from experts. This finding is in line with the research of Qomara et al. (2024) which shows that the utilization of digital teaching materials based on the Book Creator application can improve the learning outcomes of fifth grade students at SDN Pakis 5 Surabaya in IPAS subjects. The main similarity between these two studies lies in the use of Book Creator as an interactive learning medium that can deepen understanding and increase student interest in the material being taught.

Another study by Nisa et al. (2024) who developed interactive teaching materials based on Book Creator with a Problem-Based Learning (PBL) approach also showed excellent validation results, and an increase in the number of students who exceeded the KKM. This further supports the findings in this study, that digital teaching materials designed interactively and context-based can encourage the achievement of maximum learning outcomes. However, there are differences in the approaches used. While Nisa et al. combined the media with a problem-based learning model, this study focuses more on the development of the media without explicitly adopting a particular learning model.

On the other hand, research of Madina & Zulherman (2023) which developed an e-book with the help of Book Creator on the topic of the human circulatory system also found that the media produced was quite effective in improving student learning outcomes, and was declared feasible and practical for use in the learning process. These results further confirm the advantages of Book Creator as an efficient digital learning medium, especially for science materials that require visualization, such as in this research material, namely the human respiratory system.

### 2.1. Implications

The use of Book Creator as a medium for developing teaching materials has been shown to be effective in enhancing student learning outcomes. This media is able to combine visual, audio and interactivity elements that are very suitable for the characteristics of elementary school students. Learning materials that match each student's individual learning style help make the educational experience more engaging and enjoyable (Faridah et al., 2020). Visualization integrated into the learning system can increase deeper understanding and active involvement of students in learning (Wang et al., 2023). Book Creator has also been found effective in supporting digital literacy and learning motivation, particularly through multimedia integration that meets learners' needs (Pradana et al., 2024). Additionally, interactive digital books help foster self-directed learning and improve student engagement when used as cognitive tools in technology-enhanced environments (Petare et al., 2023).The validation by experts and trial results indicate that this product is of excellent quality and highly suitable for use in the learning process.

### 2.2. Research contribution

This research proves that digital teaching materials based on Book Creator can be an alternative solution to overcome the limitations of conventional learning media. The implication is that teachers can more easily facilitate interesting, interactive, and effective learning according to the needs of 21st century learners.

### 2.3. Limitations

The study was limited to one elementary school and conducted on a small scale. In addition, the materials developed only covered the topic of the respiratory system. This limits the generalizability of the research results more broadly.

### 2.4. Suggestions

Further research is suggested to be conducted on a larger scale in a wider scope and a variety of other learning topics. In addition, training for teachers in the use of the Book Creator application is highly recommended so that the implementation of digital teaching materials becomes more optimal and equitable.

## D. Conclusion

This study utilizes the ADDIE research design model (Analysis, Design, Development, Implementation, and Evaluation). Overall, the media expert validation results obtained an average score of 91.66, categorized as very good. The linguist validation also fell into the very good category, and the material expert validation yielded an average score of 93.33 (with another material expert validation showing an average score of 90), both categorized as very good**.** The teaching material trial results indicated a 90% passing percentage**.** For effectiveness assessment, an N-gain score of 0.6 was obtained. Future researchers can enhance the teaching materials by enriching the content from a wider variety of sources, thus providing students with more information.

## E. Acknowledgment

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## F. Author Contribution Statement

**TR**, served as the main supervisor and provided conceptual direction for the research. **AR** was in charge of compiling research instruments and contributed to designing the theoretical framework and methodology used. **ANP** was in charge of designing teaching materials and product development. **AN** was responsible for collecting and analyzing data from the field. **SU** facilitated the implementation of trials in schools and provided input related to the application of teaching materials in the field.

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