



Pdf-Based Digital Comic Innovation Class V Human Respiratory System Material

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Abstract: This research is motivated by the limitations of learning media in science learning content, so students need help understanding the material. This study aims to examine the feasibility and test the effectiveness of PDF-based digital comic media material on the human respiratory system. This type of research is Research and Development (R&D) with the Borg and Gall development model. The subjects of this study were fifth-grade students at SD Negeri 2 Pagersari with 36 students. Data collection techniques using observation, interviews, documentation, questionnaires, and tests. Data analysis techniques use product feasibility and initial and final data analysis (t-test and N-gain test). The research results show that; (1) it is appropriate to use the percentage of material experts and media experts who get percentages of 87% and 100%, as well as teacher and student responses of 97% and 93%; (2) it is effective in increasing student learning outcomes with the results of the t-test showing a significance value (Sig.) of the variable results of the Pretest and Post-test in class V SD Negeri 2 Pagersari is 0.001, so H₀ is rejected. At the same time, the results of the N-gain test analysis showed 64.526 with the medium criteria category. This study concludes that PDF-based digital comic media has proven to be feasible and effective as a learning medium and can improve science learning outcomes on the material of the human respiratory system for class V SD Negeri 2 Pagersari.

Keywords: Digital Comics; Innovation; Repiratory System

Introduction

Indonesia is a country that highly upholds the rights of every nation. One of them is the right to education. Education is the right of all nations; therefore, education is a benchmark for the progress of this nation and state (Aprilisa, 2020). Education is an important tool for cultivating quality human resources (HR), which can increase intelligence, skills, superior personality, and noble character, thereby supporting the country's national development. This is in line with the regulations UU RI Number 20 Year 2003 that education is a conscious and planned effort undertaken to create learning facilities and learning processes to activate students in developing the potential to have religious and spiritual strength, self-control, personality,

intelligence, noble character, and skills needed for himself, society, nation, and state.

Learners are important and will be included in the education system. An education system can be of high quality if the teaching and learning process is fun and challenging so that students learn as much as possible through a continuous learning process (Syakrani et al., 2022). On PP Number 32 Year 2013 pascal 19 (1) concerning National Education Standards, explains that the learning process in educational units is organized interactively, inspiring, fun, challenging, motivating students to participate actively and providing sufficient space for the initiative, creativity, and independence by talents, interests, and physical and psychological development learners. A learning process can be successful if the teaching and learning activities can

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generate the learning process (Firzanah & Rasyida, 2023). The selection of learning media that supports active student involvement will impact student learning motivation. Using various learning media can create a new classroom atmosphere of innovation and creativity.

Learning media is included in the part of the learning process that is regulated in Permendikbud Number 22 Year 2016 the Learning Process Standard states that learning planning includes preparing learning implementation plans and preparing learning media and resources; learning assessment tools, and learning scenarios. Teachers use learning media to convey material so students can easily understand it (Wahyuningtyas & Sulasmono, 2020). The use of learning media can motivate and stimulate students. When teachers use media in the learning process, the learning atmosphere in the classroom will be more effective and enjoyable. Learning media is an object (a tool, material, or situation) used as an intermediary in a learning activity (Miftah, 2013). *Educational media* is a tool that helps the teaching and learning process and helps clarify the meaning of the information conveyed so that learning objectives can be achieved better and more perfectly (Firmadani, 2020). Appropriate learning media need to be used to increase basic knowledge and attract students' attention. Learning media can be in the form of visual, audio, or audio-visual media. Visual media is learning media that can only be observed by students' senses of vision (Nurgiansah, 2022).

Based on pre-research activities that researchers have carried out, documented data on learning outcomes for fifth-grade students at SD Negeri 2 Pagersari, Tlogomulyo District, Temanggung Regency, shows that student learning outcomes are still low, especially in science content, out of 36 students 21 students (58%) have not fulfilled the standard minimum of value and 15 students (42%) have fulfilled the standard minimum of value.

The thing that causes low student learning outcomes is the limited learning media, especially in science content; this is also a factor in other problems. Science media is limited to posters, human organ props, damaged human skeletons, magnifying glasses, and magnets, where each number is only one. In contrast, the scope of science material is very broad. The teacher needs to maximize information-based electronic learning media and existing learning media in the learning process. Apart from being a means of conveying material to students in learning, media can also be used as a support in the learning process in class so that it can be optimally achieved. Based on the problems found in class V, researchers are interested in developing interesting, effective, and efficient media for students that are adapted to their stage of development

by using concrete media that can facilitate and optimize students' understanding of the material being taught.

Another problem encountered when the learning process took place, the enthusiasm of students to participate in learning was still low; this was due to the Covid-19 pandemic where the government issued a policy for online learning/learning from home so with this policy, students were comfortable with it, and they become lazy to follow the learning in class.

The researcher provides a solution in the form of developing Digital Comics media which contains cartoon characters in which certain story sequences are connected through pictures. The story used in the Digital Comic is about material on the human respiratory system, packaged in an interesting story form. This Digital Comic will be developed in pdf format and can be operated via Android and PC. This Digital Comic Media supports the learning process, where this media can be used during learning and can be used when students study at home after school.

The development of Digital Comics media content for natural science lessons on the human respiratory system refers to previous research, including those carried out by Sri Ayu dan Semara Putra this study indicate that digital comics are appropriate for use in elementary schools (Pinatih & Putra, 2021; Rosyida, 2019; Suparmi, 2018). Moreover, this is strengthened by research conducted by Surya et al. (2020) this study's results indicate an effective use of digital-based educational comic media in increasing elementary school student's interest in reading. Researchers developed a learning media in the form of PDF-based digital comics. This media can be used in science content learning, especially in the subject of the human respiratory system in class V SD Negeri 2 Pagersari.

Based on expert theory and relevant previous research, the researchers overcame problems in the content of a science development research (R&D) lesson entitled Development of PDF-Based Digital Comics Material on the Human Respiratory System Class V SD Negeri 2 Pagersari, Tlogomulyo District, Temanggung Regency. The formulation of the problem in this research is how is the feasibility of developing media design, how is the feasibility of the media, and how is the effectiveness of PDF-Based Digital Comics media PDF-Based Human Respiratory System material for Class V SD Negeri 2 Pagersari, Tlogomulyo District, Temanggung Regency. The purpose of this study was to develop media design, test the feasibility of the media and test the effectiveness of PDF-based digital comic media on PDF-based human respiratory system material for Class V SD Negeri 2 Pagersari, Tlogomulyo District, Temanggung Regency.

Method

The research researchers use a type of *Research and Development* (R&D). That the research and development method is a research method used to produce a product and test the effectiveness of the product (Sugiyono, 2017). *Research and Development* is a scientific way to research, design, produce, and test the validity of the products that have been produced. Product development is not always in the form of objects or hardware, such as books, modules, and learning aids in the classroom or the laboratory. However, it can also be in software, such as computer programs for data management, classroom learning, or even education and learning models.

This study uses the Borg and Gall development model which consists of 10 stages, namely 1) potential and problems, 2) data collection, 3) product design, 4) design validation, 5) design revision, 6) small-scale product trial, 7) product revision, 8) trial large scale usage, 9) product revision, and 10) final product. The product developed is in the form of PDF-based Digital Comic media content for science lessons material for the human respiratory system for class V SD Negeri 2 Pagersari, Tlogomulyo District, Temanggung Regency, totaling 36 and 2 class teachers. Data collection techniques using observation, interviews, documentation, questionnaires and tests. Data analysis techniques use product feasibility, initial, and final data analysis (t-test and N-gain test).

Feasibility test

Assessment of the feasibility of pdf-based digital comic media was obtained from the results of expert validation and the responses of teachers and students to pdf-based digital comic media by making a feasibility instrument. Assessment of the feasibility of pdf-based digital comic media was analysed by an expert validator with an instrument made with a Likert scale. The researcher determines the score of the Likert scale as represented in Table 1.

Table 1. Likert Scale Score

Criteria	Score
Very good	4
Good	3
Enough	2
Not enough	1

The feasibility research instrument for pdf-based digital comic media by experts is analysed using the formula 1 (Sudjana, 2013).

$$P = \frac{f}{N} \times 100\% \tag{1}$$

The results of the percentage of eligibility data are then converted with the criteria Table 2.

Table 2. Due Diligence Criteria

Percentage (%)	Criteria
86 -100	Very Worth
76 - 85	it Worthy
60 - 75	Decent Enough
55 - 59	Less Eligible
< 54	Not Feasible

Preliminary data analysis

Preliminary data analysis was carried out descriptively regarding the level of needs of students and teachers for digital learning media in class V-conscious schools. The description was based on a needs questionnaire given to teachers and fifth-grade students at SD Negeri 2 Pagersari.

Final data analysis

The final data analysis to determine the effect of pdf-based digital comics is calculated using the normality test and gain index. The normality test is calculated using the Saphira Wilk test formula assisted by the SPSS 29 software application.

The values obtained from the results of the pre-test and post-test Vare the data that will be analysed descriptively by calculating the percentage of student learning completeness using the N-gain test with the formula 2 (Lestari, K & Yudhanegara, 2017).

$$N\ gain = \frac{score\ post\ test - score\ pre\ test}{score\ maximum - score\ pre\ test} \tag{2}$$

Table 3. Criteria for improving learning outcomes

Interval	Criteria
N-gain < 0.3	Low
0.3 ≤ gain < 0.7	Currently
N-gain ≥ 0.7	High

The independent variable in this study was the PDF-based digital comic media. In contrast, the dependent variable resulted from learning science content on the material of the human respiratory system.

Result and Discussion

In the development research that researchers at SD Negeri 2 Pagersari have carried out, researchers developed a media to support and optimize science learning on human respiratory system material for class V. The learning media is in the form of Digital Comics, which are very attractively designed and in pdf format, which keeps abreast of technological developments and is easy to use in the learning process. This research adapts the development model from Borg and Gall; the

following are the steps studied in this development research.

Potential and Problems

The researcher obtained several analytical processes at the potential and problem stages. Researchers in pre-research activities conducted a needs analysis through observation, questionnaires, and direct interviews with class teachers VA and VB.

Interviews and observations conducted by researchers with class V teachers at SD Negeri 2 Pagersari obtained results in the form of facts regarding the curriculum set. They used in class V that is following the 2013 curriculum. However, during the learning process, there were obstacles, such as limited learning media, especially in science content. This is also a factor in other problems. Science media is limited to posters, human organ props, damaged human skeletons, magnifying glasses, and magnets, where each number is only one. In contrast, the scope of science material is very broad. In the learning process, the teacher has not maximized information-based electronic learning media and existing learning media.

Another problem encountered when the learning process took place, the enthusiasm of students to participate in learning was still low; this was due to the Covid-19 pandemic where the government issued a policy for online learning/learning from home so with this policy, students were comfortable with it, and they become lazy to follow the learning in class. This has an impact on student learning outcomes. Based on document data on the learning outcomes of class V SD Negeri 2 Pagersari, it shows that student learning outcomes are still low, especially in science content; out of 36 students, 21 students (58%) have not fulfilled the standard value minimum, and 15 students (42%) have fulfilled the standard value minimum.

Data collection

Data on media production was collected through direct interviews with fifth-grade teachers at SD Negeri 2 Pagersari, Tlogomulyo District, Temanggung Regency. In addition, data collection was also obtained from a needs questionnaire distributed by researchers to teachers and students in fifth grade. The purpose of the questionnaire distribution was to collect information that would be used as material for product planning which would be a solution to overcome problems in learning science. A needs questionnaire was given to fifth-grade teachers and fifth-grade students at SD Negeri 2 Pagersari with 35 students.

Product Design

PDF-Based Digital Comic Media is a comic in PDF form that can be accessed via Android and PC. PDF-

Based Digital Comic Media is presented with funny pictures and adapted to the surrounding conditions to attract students' attention to learning, make it easier for students to understand material on the human respiratory system, and support the learning process in science content. Comics in language come from Dutch, namely Komiek, which means comedian. In Greek, comics come from the word "komikos" or "kosmos," which means to have fun or joke, so comics can be interpreted as visual media that use speech bubbles, pictures, and characterizations in the storyline (Batubara, 2021). Digital comics, according to Lamb & Johnson (2009), are simple comics presented in certain electronic media. It can be said that digital comics are a form of illustrated stories with certain characters that present information through electronic media. The advantage of digital comics is that they can be combined with programming so that sound, movement, and even the story's progress in the comic itself can be selected and determined. Digital comics can be combined with Virtual Reality and Augmented Reality technology, with comic narratives that are connected to the real world in real-time, with increasingly sophisticated gadgets, digital comics will automatically continue to grow (Ramadhan, 2020).

The 2013 curriculum emphasizes the learning process through a scientific approach. This approach encourages students to think critically, analytically, and precisely in identifying, understanding, solving problems, and applying learning material. This scientific approach follows science learning (Sayekti et al., 2019). IPA is the meaning of alms and various phenomena packaged into a set of theories through scientific work (Ariastika, 2022; Iswatiningsih, 2021; Mariana & Praginda, 2009; Nurjannah, 2022). Science can give character to develop the potential that exists in students by starting from curiosity about all natural phenomena and problems which then motivates students to make direct observations experienced by students (Sulthon, 2016).

PDF-Based Digital Comic Media was designed with the help of several software such as Corel Draw X7 and Canva. The design of the PDF-Based Digital Comics media consists of a cover, title page, author name page, preface, table of contents, KI and KD, indicators and learning objectives, how to use comics, character introductions, story content explaining the human respiratory organs and their functions and how to protect the human respiratory organs, quiz questions, bibliography, author biodata. PDF-Based Digital Comic Media was developed in Indonesian-like everyday language so that the contents of the material explained can be easily accepted and understood by students. This media consists of more than 20 panels equipped with

various types and font sizes that are tailored to the needs of each page on the media.



Figure 1. PDF Based on Digital Comic Media Development Design Material System Human Breathing

Design Validation

Researchers carried out design validation as a reference for learning media and to determine the feasibility of media products developed by researchers through validation assessments from media experts and material experts. Assessment from experts is necessary for developing this learning media product because material experts and media assess it in terms of presenting the design of media products and the material's content from this learning media. The researcher then gave a questionnaire to the experts as an instrument used in learning assessment. In this assessment, the researcher uses a questionnaire with a Likert scale, where experts can put a checklist on each aspect of the assessment. In addition to the checklist, experts can also provide comments and suggestions regarding media products to researchers to then use as a reference in making improvements to learning media products in order to produce a good learning media (Saputra & Pasha, 2021; Dwiputra et al., 2020).

Design Revision

Design revision is one of the stages of media improvement after getting various suggestions and input from each expert validator. Improvements need to

be done to get a suitable media product for use in the learning process.

Small scale test

A small-scale trial was carried out for PDF-based digital comics that have been revised according to suggestions and input from various experts. Small-scale trials involve students with a total of 6 students. The small-scale trial activity aims to see how students respond to using pdf-based digital comics. In a small-scale trial, the researcher gave a questionnaire to students and teachers as a form of response regarding the media being tested by the researcher. The results of the response questionnaire were then used as material for consideration in improving the learning media developed by researchers.

Table 4. Recapitulation of small-scale student and teacher responses

Response	Total Score	Percentage (%)	Category
Students	341	94	very good
Teacher	94	94	very good

The assessment carried out by students obtained a score of 341 out of a total score of 360, resulting in a percentage of 94% with very good criteria. At the same time, the assessment carried out by the teacher obtained a score of 94 out of a total score of 100. The score was then analysed and produced a percentage of 94% with very good criteria. In small-scale trials, researchers also provide pretest and post-test questions to students; this can also be used as material for consideration in continuing trials on a large scale. The following are the results of small-scale trials in the form of pretests and post-tests.

Table 5. Results of small-scale trials

Action	N	Mean	Difference	N-Gain	Criteria
Pre	6	48.333	30	0.58	Mediu
Post	6	78.333		1	m

Based on the Table 5, there is an increase in the average learning outcomes of students' knowledge aspects after using PDF-based digital comic learning media. The average value of the pretest and post-test has a difference of 30, and the N-gain value of the pretest and post-test is 0.581 in the moderate category.

Product Revision

At this stage, the activity of revising PDF-based digital comics was carried out by researchers by paying attention to all responses as well as suggestions from students and teachers during small-scale trials. However, based on the results of the responses and all

the suggestions and input from students and teachers of grade V, the PDF-based digital comic does not need to be revised. Instead, pdf-based digital comics are declared feasible and can be directly used in large-scale trials in class V SD Negeri 2 Pagersari, Tlogomulyo District, Temanggung Regency.

Usage Trial

This large-scale trial phase was conducted by teaching 30 grade V students at SD Negeri 2 Pagersari. The learning process uses media developed by researchers, namely digital comics based on PDF material on the human respiratory system, to support the ongoing learning process. The use of PDF-based digital comics is carried out after students have completed the pretest given by the researcher. Learning is carried out following the RPP that the researcher has compiled. Then after finishing providing learning material using pdf-based digital comics, students were asked to work on post-test questions.

Response questionnaires regarding pdf-based digital comics were distributed to grade V students and teachers for their responses. Researchers will use the results of the questionnaire as a reference to find out and assess how effective pdf-based digital comic media developed in natural science learning is the material of the human respiratory system.

Mass production

The final product of this research is PDF-based digital comic media, material for the human respiratory system, which has been validated and revised according to suggestions from experts, teachers, and fifth-grade students and has been tested for validity and effectiveness so that it can be used in science learning as a support as well as supporting natural science learning resources. in class V SD Negeri 2 Pagersari, Tlogomulyo District, Temanggung Regency.

Data analysis

Data analysis is the stage of analysing data from student learning outcomes data on the cognitive aspect. The results of research and development of PDF-Based Digital Comics media on human respiratory system materials include: assessing the feasibility of PDF-Based Digital Comics media and evaluating the effectiveness of PDF-Based Digital Comics media.

Feasibility of PDF Based Digital Comic Media on Human Respiratory System Material.

Assessment of the feasibility of PDF-Based Digital Comics learning media for human respiratory system material was assessed by two experts, namely material experts and media experts; the results of the assessment of the two experts are in Table 8.

Table 6. Feasibility Assessment PDF-Based Digital Comics learning media material for the human respiratory system

Expert	Total Score	Gain Score	percentage (%)	Category
Material	80	69	87	Very worth it
Media	80	80	100	Very worth it

Based on Table 6, it is shown that material experts give a score of 69 with a validity percentage of 87% with very valid criteria. The media experts give a score of 80 with a validity percentage of 100% with very valid criteria. Based on the results of the two expert assessments, an average score of 93.5% was obtained with very decent criteria. Based on the scoring from the experts above, the learning media for PDF-based digital comics material on the human respiratory system is very suitable for the learning process (Saputra & Pasha, 2021b; Syaferi et al., 2022). Therefore it can be concluded that PDF-based digital comic media on human respiratory system material that researchers have developed is included in the very feasible category and can be used at the trial stage of use at SD Negeri 2 Pagersari, Tlogomulyo District, Temanggung Regency by improving the suggestions and input from the two experts.

The Effectiveness of PDF-Based Digital Comic Media Material on the Human Respiratory System

The effectiveness of PDF-based Digital Comics learning media on human respiratory system material using the t-test and N-gain test. Before conducting the t-test, the normality and homogeneity tests were first carried out. The normality test of pretest and post-test learning outcomes data is calculated using the Liliefors Test formula with the help of Microsoft Excel. The following table shows the normality test results in Table 9.

Table 7. Normality Test Results of Pretest and Post-test Values

Action	N	Mean	Std. Deviation	L ₀	Category
Pre	30	45.50	13.15	0.080	Normal
Post	30	79.67	12.66	0.113	Normal

The homogeneity test of pretest and post-test learning outcomes data was calculated using SPSS. The following table shows the homogeneity test results in Table 8. Based on the "Test of Homogeneity of Variances" output Table 8, it is known that the significance value (Sig.) of the variable Pretest and Post-test results in class V SD Negeri 2 Pagersari is 0.741. Sig. The value 0.741 > 0.05, then as the basis for decision making in the homogeneity test above, it can be

concluded that the variance of the data from the pretest and post-test results of class V SD Negeri 2 Pagersari is the same or homogeneous.

Table 8. Homogeneity Test Results of Pretest and Post-test Values.

		LV	df1	df2	Sig.
Pre-	Mean	0.110	1	58.000	0.741
Post	Median	0.148	1	58.000	0.702
	Median and with adjusted df	0.148	1	58.000	0.702
	Trimmed mean	0.136	1	58.000	0.714

After the normality and homogeneity tests were conducted, a t-test was conducted to measure the effectiveness of using PDF-based Digital Comics media, which can be seen from student learning outcomes consisting of pretest and post-test scores. Pretest and post-test values can be seen in Table 11.

Table 9. T test results pretest and post-test values

	N	Mean	Std. Deviation	Std. Error Mean	t	df	Sig.
Pre	30	45.5000	13.15360	2.40151	-	29	<0.0
Post	30	79.67	12.658	2.311	13.228		01

Based on the "Paired Sample Statistics" table above, it is known that the significance value (Sig.) of the variable results of the Pretest and Post-test in class V SD Negeri 2 Pagersari is 0.001. So that H0 is rejected because of the value of Sig. 0.001 < 0.05, there is a significant difference between the pretest and post-test results. PDF-based digital comic media developed by researchers can improve the learning outcomes of fifth-grade students at SD Negeri 2 Pagersari in science content.

This research is supported by research conducted by Riwanto & Wulandari (2019) that using digital comics made with Cartoon Story Maker software can increase the effectiveness of learning the theme material, always saving energy. The results of data calculations show that the Sig Paired Samples Statistics is 0.000, and the correlation value is 0.766. While the results of the Paired Samples Test Sig 2-tailed = 0.000. This shows that the use of digital comic media significantly influences the learning process. After conducting the t-test, the next step is to calculate the N-gain, which can be seen in Table 12.

Tabel 10. N-gain test results

Action	N	Mean	Different	N-Gain	Criteria
Pre	30	45.50			
Post	30	80.667	35.167	64.526	Medium

Based on Table 10 regarding the acquisition of N-gain in the pretest and post-test values, the average difference is 35.16667 with an n-gain of 64.52599388 and is included in the medium criteria. This shows that using PDF-based Digital Comics learning media for human respiratory system material effectively improves student learning outcomes.

This research is supported by Astutik et al. (2021) shows that the results of the experimental class obtained an n-gain value of 0.55 in the medium category, while the control class obtained an n-gain value of 0.28 in the low category. Thus, the study results indicate that the developed digital comic media is suitable for use in social studies learning to strengthen students' character

In addition, the experience of digital comics developed by participants in the Atatürk's Principles and History of Revolutions course, in the study it was concluded that the comics developed had a positive effect on attitudes towards lessons, increasing participants' thinking abilities. This experience turned the learning process into a funny, meaningful, and permanent process, enabled distance education to become interactive, increased motivation, and strengthened in-group communication in the distance education process (Şahin & Kara, 2022).

Student and Teacher Response Questionnaire

PDF-Based Digital Comic Media material on the human respiratory system that has been appropriate according to material experts and media experts is then given to teachers and students to give feedback. The student response questionnaire is given to students at the large-scale trial stage. Large-scale trials were carried out in class V with many students at the large-scale testing stage. A large-scale trial was conducted in class V with 30 students and one teacher who showed good results on the PDF-Based Digital Comics media developed on the human respiratory system. Students and teachers responded by filling out a questionnaire distributed by the researcher. After students and teachers respond, the following results are obtained.

Table 11. Recapitulation of Student and Teacher Response Results

Response	Total Score	Percentage (%)	Category
Students	1672	93	Very good
Teacher	97	97	Very good

The assessment carried out by students obtained a score of 1672 out of a total score of 1800, resulting in a percentage of 93% with very good criteria. At the same time, the assessment made by the teacher obtained a score of 97 out of a total score of 100. The score was then analyzed and resulted in a percentage of 97% with very good criteria.

The results of the class IV teacher response questionnaire show a practicality percentage of 90% in the very practical category. The results of the questionnaire responses of class IV students were 94.53%. Based on effectiveness, the learning outcomes of class IV students increased from 66.88% to 88.81% (Sari & Erita, 2021).

The overall findings in this action research indicate that the implementation of PGA in seventh grade positively affects students' perceptions. The student composition results improved significantly across all evaluated criteria (content, genre structure, vocabulary, grammar, and mechanics) (Montiel Muñoz, 2022).

Conclusion

The development of this media is highly adapted to the results of observations, interviews, and questionnaires for the needs of teachers and students. This Digital Comic Media was designed with the help of several software such as Corel Draw X7 and Canva. This media consists of more than 20 panels equipped with various types and font sizes that are adjusted to the needs of each page on the media. The developed media has met material and media experts' valid criteria. PDF-Based Digital Comic Media gets a percentage of 87% with very feasible criteria from material experts, while media experts get 100% with very feasible criteria. PDF-Based Digital Comics media proved to be very suitable for use as a medium for learning science. They proved to be very effective in improving science learning outcomes for the material of the human respiratory system for class V SD Negeri 2 Pagersari, Tlogomulyo District, Temanggung Regency.

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Author Contributions

Hasanah Febriyanni Rahayuningsih is the main researcher and author of this article. Rahayuningsih is in charge of collecting data, making instruments for the needs of teachers and students, carrying out teaching, and conducting learning evaluations. In addition, Rahayuningsih develops and tests research products.

Deni Setiawan is the second researcher and author of this article. Setiawan is in charge of validating instruments and carrying out learning evaluations. In addition, it also validates the initial product design before going to the media validator and experts. After the data was obtained, Setiawan was tasked with conducting research data analysis.

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Conflicts of Interest

The authors declare no conflict of interest.

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