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Development of Flipbook Assisted by Augmented Reality Media on Human Respiratory System Subject of IPAS in Grade V Elementary School

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Abstract: This study aims to develop media Flipbook assisted by Augmented Reality on human respiratory system subject of IPAS in grade V Elementary School. The method used in this research is through qualitative approaches and quantitative or R&D with the ADDIE model consisting of analyze, design, development, implementation, and evaluation. The population in the study were fifth grade students of Sibebek Elementary School. The total number of 30 students and 1 teacher. The results of the feasibility of Flipbook assisted by Augmented Reality media get 91% and 93% from material and media experts. While from teachers and students of 85% and 96.15%. Sig value. Pretest 0.200> 0.05 and posttest 0.146> 0.05 so that the data is normally. distributed. The increase in the average value (N-Gain) was 0.71 with a high category. So that the Flipbook media assisted by Augmented Reality on the material of the human respiratory system in class V are feasible and effective in improving the results in learning science on the material of the human respiratory system in grade V.

Keywords: Augmented Reality; Flipbook; Human respiratory system

Introduction

The right to education in Indonesia is regulated in the UUD 1945 Pasal 31(1) and Pasal 31(2) which explains that education can determine the progress of a country (Nadziroh et al., 2018). According to Undang-Undang (UU) Nomor 20 Tahun 2003 Tentang Sistem Pendidikan Nasional, education System national has the function of developing abilities and also creating the character and civilization of a dignified nation.

The educational process occurs because of learning activities, namely the sharing between process teachers and students (Hapudin, 2021). Through the sharing process, students gain experience and change their behaviour (Susanto, 2019). Education consists of several sub-sections of science that are important for human life. One of these important is the subchapter's science scienceof nature and social. Science in general grows and develops according to the changes that occur in the universe (Dela et al., 2022).

Regulation of the Minister of Education, Culture, Research, and Technology Number 12 of 2024 concerning the Curriculum in Early Childhood Education, Elementary Education Level, and Secondary Education Level, discusses the policy of using a new curriculum, namely the independent curriculum. The independent curriculum itself is a curriculum that provides flexibility for students to learn according to the needs and interests of students.

The implementation of this kurikulum merdeka also affects learning at the primary school. That influence occurs is the merging of the sub-disciplines of science and social studies into IPAS. IPAS learning in schools elementary is independent, namely independent expected to realize the concept in the curriculum learning so that learning is carried out in a meaningful

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and enjoyable way where students are given freedom of thought (Wijayanti & Ekantini, 2023).

Meaningful and enjoyable learning can be done with the role of learning media. According to Rizal et al. (2016) learning media is an intermediary in the form of a tool to help convey learning material. The existence of learning media in IPAS, makes it easier to provide understanding to students of a material (Mudinillah et al., 2022). Aligned with Wahyuningtyas et al. (2020) which states that learning media can help students understand material easily and improve learning outcomes. Primary school-age students are at the stage concrete operational which tends to need to try and provide real experiences to understand concepts, so it is in accordance with the concepts in the learning media (Habib et al., 2020).

In addition to the use of learning media, the things that need to be considered to realise learning meaningful and enjoyable IPAS are .using the right approach. The right learning approach will pay attention to the needs of different, Kusumaningpuri (2024) states that it is not uncommon for with students to feel frustrated learning approaches that are not in accordance with the needs of students approach. The is a right differentiated learning approach that suits the needs of learners and helps in improving the learning outcomes obtained (Insani & Munandar, 2023). Differentiated learning components consist of 4 important components, namely content/material, process, product, and learning environment (Bayumi et al., 2021).

In reality, meaningful and fun learning is difficult to do. This is because the utilisation of media learning is still not optimal due to the limited ability and knowledge of teachers in making media. These results were obtained during observations and interviews conducted in class V of Sibebek State Elementary School In addition to the lack of media utilization, there are also obstacles in the learning approach that is not in accordance with the needs of students.

Data on the in IPAS learning there are still many who have not reached KKTP (Kriteria Ketuntasan Tujuan Pembelajaran) for results of the acquisition of mid-semester test scores of class V SD Negeri Sibebek students as many as 30 students, Completeness of Learning Objectives), can be seen in the figure 1.

Based on the picture, it shows that there are still many students who have scores below the KKTP. Learning that tends to be monotonous without learning media causes instability in student motivation. These problems are be considered by researchers to able to provide learning innovations to help IPAS learning The development of this media is based on the results of interviews, observations, and also an analysis of the needs of students and teachers that have been carried out by researchers. At this stage, it was found that learning science in grade V of SD Negeri Sibebek requires learning media that is interactive, integrated with the media, and also easily accessible anywhere. In addition, it is also hoped that it will not eliminate the existence of real media so that students can still have real experiences during learning and enhance learning outcomes in science education. The selection of material in the media is based on the results of student voting and also the nature of the material, which tends to be abstract and difficult to understand because it cannot be seen directly by the eye, namely material about the human respiratory system. So, with the help of technology, researchers realized the existence of technology-based media that combine real and semi-real objects in IPAS learning namely, Flipbooks assisted by Augmented Reality on human respiratory system materials.

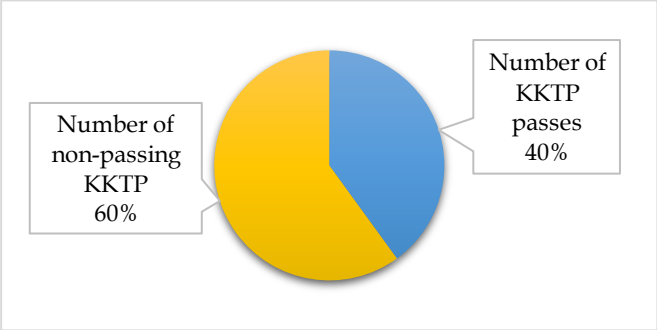

Figure 1. Grade V IPAS score of Sibebek Public Primary School

Research conducted by Fitriani et al. (2023) AR-based flipbook media is an innovation attractive, conducive, effective, and efficient learning media This aims study to develop Flipbook assisted by Augmented Reality media to help IPAS learning become more meaningful and enjoyable so IPAS learning outcomes of students in grade V elementary schools can be improved.

Method

The research approach in this study ia a Research and Development (R&D) with the model ADDIE development (Sugiyono, 2022). The development model according to ADDIE consist of 5 stages, analyze, design, development, implementation, and evaluation.

The analyze stage is the stage of analyzing problems that occur through a structured process, namely interviews and questionnaires. At this stage, there is a problem identification process recapitulation of the results of the teacher and students' needs survey. The second stage is the design stage to design and identify components involved in the development of Flipbook media assisted by Augmented Reality on

human respiratory system materials. Development is the stage of making learning media based on the design that has been made. The next stage is implementation, namely the stage to implement the media that has been developed to determine the feasibility and effectiveness of the developed media. The final stage of evaluation, which is the stage to find out the final results obtained during the development of Flipbook media assisted by Augmented Reality on human respiratory system materials, is seen based on the teacher's response questionnaire and the average N-Gain test.

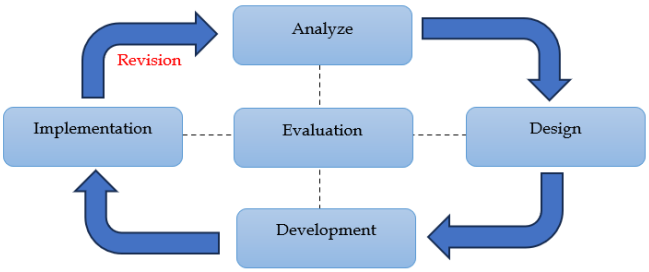

Figure 2. ADDIE model chart

The research and development of Flipbook assisted by Augmented Reality media is conducted at Elementary School of Sibebek, Bawang District, Batang Regency. The population in this study were 30 students and a fifth grade teacher. The final product in this development is a digital book with 3D AR objects in it to explain the learning material of the human respiratory system design and method should be clearly defined.

Result and Discussion

This research conducted to develop Flipbook assisted by Augemented Reality is carried out through various structured stages following the step of ADDIE model.

Development Flipbook Assisted by Augmented Reality Media

The first stage is analyze stages includes problem analysis and need analysis aimed to teachers and students that carried out through observation, interview, and need survey. The recapitulation of the results of teacher and students' need survey can be seen in the tables 1 and 2.

Based on tables 1 and 2, it can be concluded that teachers and students need IPAS learning media that can enhance learning motivation. The media needed are technological media with a combination of visual, audio, and audiovisual elements to meet the diverse needs of students. Students and teachers need learning media in subjects IPAS to assist in learning so that can be carried out in an interesting, fun, meaningful way, and also improve outcomes on abstract material, namely human respiratory system material.

Table 1. Results of Students' Need Survey

Statements	Answer
The teacher and students are experiencing difficulties in IPAS learning.	Yes
Facilities and infrastructure supporting IPAS learning are available.	Yes
Often using media in IPAS learning.	No
Needs media that fosters students' learning motivation.	Yes
Media integrated with technology.	Yes
Combining visual, audio, and audiovisual components.	Yes

Table 2. Results of Teacher's Need Survey

Statements	Answer
Students enjoy learning IPAS.	100%
Students enjoy learning about human respiratory system.	10%
Feeling difficulty in understanding the material.	76.67%
The teacher uses media during IPAS lesson.	16.67%
Media integrated with technology.	90%
Combining visual, audio, and audiovisual.	93.33%
Students enjoy learning at school and outside of school.	100%

After conducting a needs, analysis the researchers conducted a design stage to design important components and aspects in the development of media learning. At this stage it is designed regarding learning outcomes, learning, objectives and also materials learning. The design made will be a reference in making Augmented Reality-assisted Flipbook media on human respiratory system material.

The next step is development. Researchers developed Flipbook -assisted by Augmented Reality media with several combined applications and the web. The design Flipbook is made using Canva Pro with A4 portrait document size. Through Canva, flipbooks are made from the cover to the cover. In the canva application, the design flipbookis made using a combination of elements image, shapes, and appropriate so as to colours produce attractive flipbook display 3D objects are created through the web and application the Assemblr.edu. The displayed in this media are the organs of the respiratory system3D objects human. AR creation is done in the studio, marker area. In the marker area, 3D objects are given additional text, annotations, and also sound and video to add information. Furthermore, the final result of this 3D object is a qr code and a link that can be connected to a flipbook.

The last stage in making Flipbook- assisted by Augmented Reality media is the stage editing on the heyzine.com web. On this web, the steps taken are

adding actions so that the Augmented Reality link can be accessed in the Flipbook. In addition, adding video and sound, features and setting the background on the Flipbook display.

After going through several stages development, the media will go through a validation process carried out by expert. The validation process validators aims to provide a assessment of feasibility the media to be continued at the trial stage. The feasibility assessment is calculated using the following percentage formula 1 (Purwanto, 2016).

$$NP = \frac{R}{SM} \times 100\% \quad (1)$$

NP = the precentage number to be sought
R = the score obtainde
SM = Max Score

Some of the aspects used as an assessment are as follows.

Table 3. Material Expert Assessment Instrument

Aspect	Max score	Score
Relevance	16	14
Completeness	8	7
View	12	12
Amount	36	33

Table 4. Media Expert Assessments Instrument

Aspect	Max score	Score
Colour	8	8
Lettering	8	7
Image	16	14
Word Suitability	12	12
Amount	44	41

Based on the validation carried out, the developed media gets a value that can be shown in the following image.

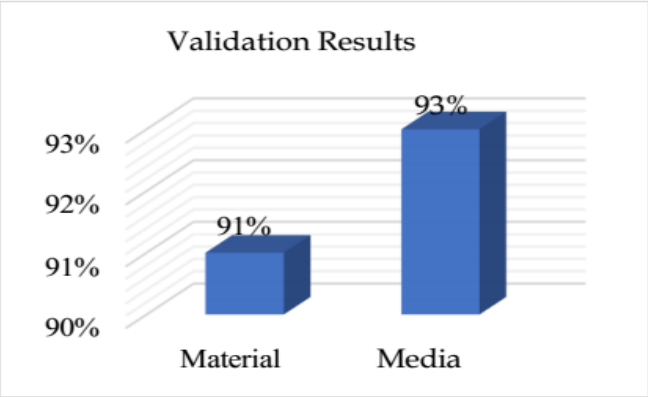

Figure 3. Diagram of assessments validation

Based on the figure 3, the assessment results from the material expert validators and media expert validators obtained a score with a very feasible category. The was assessment obtained from the material expert validator by 91%, while from the media expert validator by 93%. Both scores are included in the very feasible category. The assessment conducted for Flipbook assisted by Augmented Reality media includes aspects of appearance, content, and language used in the media.

The third stage is the implementation stage to find out that the media developed can help and answer problems in learning IPAS material on the system human respiratory in class V. At this stage, it is carried out with 2 stages, namely application for small groups and application for large groups. Small group application is carried out to analyses the short comings in the media so that when the application is large group obtained maximum results. In the small group application, the students who participated in the application were 6 students with the categories of 2 upper, ranks 2 middle, and 2 lower ranks. In this group, the media will be obtained from teachers and students for the large-group trial stage to test the effectiveness of the media. There are the results of the feasibility assessment of augmented reality-assisted Flipbook media in a small-group trial.

Table 5. Results of Teacher and Students Response

Respondents	Score	Maximum score	Percentage
Teacher	51	60	85%
Students	51	52	96.15%

Assessment of the use of Flipbook media assisted by Augmented Reality on the material Percentage of Validation Results based on the questionnaire response obtained a score of 85% from the teacher and 96.15% from the students so that it is suitable for use.

The large group consisted of 24 students of class V SD Negeri Sibebek. The application begins stage with giving pretest questions before the application of the media. The large group classes. At this stage, the class is divided next step is to apply Flipbook media assisted by Augmented Reality in learning in into several study groups to facilitate implementation. After completing the application of the media, students are given posttest questions to get outcomes student learning. The results obtained in this large group application are a consideration of whether Flipbook assisted by Augmented Reality media can help learning IPAS on the human respiratory system subject in grade V elementary school.

Table 6. Normality Test

Results	Statistic	df	Sig.
Pretest	.141	23	.200
Posttest	.154	24	.146

The results of the normality test shown in table 6. Shows data with a Sig, value pretest 0.200> 0, 05 and Sig. value Posttest 0.146> 0.05 so that the data from the results pretest and posttest are normally distributed. The normality test is carried out to determine the type of data used when processing data. Researchers use the normality test with the liliefors method.

Table 7. Normality Test Criteria (Sudjana, 2005)

Percentage	Criteria
Sig. value< 0.05	H0 rejected
Sig. value> 0.05	H0 is recognized

The last stage is namely the evaluation stage for conducting final assessment that can determine the success of Augmented Reality-assisted Flipbook media in in helping IPAS learning on human respiratory system material class V SD Negeri Sibebek. At this, its stage is determined by the results of teacher responses and also testing the increase in the average value (N-Gain).

Table 8. N-Gain Test

	N	Minimum	Maximum	Mean	Std. deviation
N-gain	24	.36	1.00	.7116	.233
N-gain percentage	24	36.36	100.00	71.155	23.315
Valid N (listwise)	24				

The effectiveness of the media was calculated based on the increase in the average the score scores of pretest and posttest with the N-Gain test.

$$N - gain = \frac{Score\ posttest - score\ pretest}{SMI - score\ pretest} \quad (2)$$

Table 9. N-Gain Score Criteria (Lestari & Yudhanegara, 2024)

Percentage	Criteria
N-Gain ≥ 0.70	High
0.30 < N-Gain < 0.70	Medium
N-Gain ≤ 0.30	Low

Table 7 shows the results that the test of increasing the average value (N-Gain) of 0.71 with a category high. Based on the Table 8 this proves that the use of AR-assisted Flipbook media is effective for use in IPAS, learning the material of the human respiratory system.

Discussion

According to Nurwidiyanti et al. (2022) flipbook media is a technological to media innovation assist in making it easier to convey material. Andini et al. (2024) state that flipbooks are learning media in the form of digital books innovative and interactive. Flipbook media can help the process of understanding material and encourage an increase in student learning outcomes (Yuliawati et al., 2022).

Apart from being a medium that helps in delivering material, Flipbook is also useful for creating learning that fosters interest in students' because it learning has an interesting. In the mix of elements Flipbook there are elements of text, and images with attractive colours according to the development of students (Nuryani et al., 2021) The level of critical thinking of students can also increase using Flipbook media in IPAS learning (Aprilia, 2021).

Safiah (2024) mentions that Augmented Reality (AR) is a technology to combine pseudo with objects real. The use of Augmented Reality media can provide active learning and also facilitate students to think critically (Zaid et al., 2022).

AR media can help in improving IPAS especially literacy skills for finding information, understanding text, and reflection and evaluation (Tetep et al., 2023). Hidayat (2024) revealed that AR media has a level of high effectiveness to improve student learning .outcomes and motivation.

Flipbook assisted by Augmented Reality media developed on human respiratory system subject is one of the innovations in learning media to facilitate the transfer of experience and knowledge. This is in line with research conducted by Kartika et al. (2024) which states that Flipbook-assisted E-Book media and Augmented Reality make it easier for students to understand material and interesting learning.

A learning media is said to be good if it can help achieve learning objectives (Kustandi & Darmawan, 2020). In addition, learning media also serves to increase interest in learning (Nurfadhillah, 2021). The met the criteria for good learning media. This is indicated Flipbook assisted by Augmented Reality media developed has by the percentage of media feasibility assessments from material and media 91% and 93% respectively in the very category experts, feasible. In addition, the results of responses from teachers and students were 85% and 96.15%.

The results of the data obtained in the study obtained a Sig. value Pretest 0.200> 0.05 and value Sig. Posttest 0.146 > 0.05 normal distribution results in acceptance of Ha and rejection of H0 (Sudjana, 2005).

The effectiveness of media Augmented Reality-assisted Flipbook on the material of the system is human respiratory analyzed based on the results of increasing the average value (N- Gain). The results of increasing the value (N-Gain average) with an average an average pretest of value of 54.38 and posttest 84.58 and an average difference of 30.2 obtained an N-Gain value of 0.71 for the high category. Overall, Flipbook assisted by Augmented Reality media on the human respiratory system subject in grade V Elementary School is feasible and effective for use. This is in accordance with research conducted by Cahya et al. (2024) which shows the results of an increase in the average N-Gain of value of 0.78 > 0.70 and included in the high category Lestari & Yudhanegara, (2024) so that it is feasible and effective for IPAS learning.

Conclusion

Researchers have developed Flipbook media assisted by Augmented Reality on the material of the human respiratory system in grade V with the R&D method and the ADDIE development model. The results of the validation assessment by material experts were 91% and media experts were 93% with a very feasible category. The normality test using the Liliefors guide showed that the test data was normally distributed with a pretest sig value of 0.200 and a posttest of 0.146 which was greater than 0.050. The N-Gain value obtained was 0.71 with a high category. Based on this, the results of Flipbook assisted by Augmented Reality media on the material of the human respiratory system are feasible and effective in improving the results in learning science on the material of the human respiratory system in grade V.

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Author Contributions
I.Y.F; as an author conducts research, collects data, develops and tests the developed media making needs, questionnaire instruments response questionnaires validation questionnaires, expert, data, processing writing articles. B.I; as a supervisors contributed to guidance, direction, and validation of research instruments.

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The author has been completed this article without a conflicts of interest with anyone else.

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