

# Development of Augmented Reality Book (AR-Book) Based Science Learning Media on Human Digestive System Material to Improve Student Learning Outcomes

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**Abstract:** This research was motivated by the low learning outcomes of students in science subjects of human digestive system material due to the lack of TPACK-based learning media innovations that make it easier for students to learn the material so that students feel bored with the media they have been using. The purpose of this study is to develop, test the feasibility, and test the effectiveness of Augmented Reality Book (AR-Book) media in improving learning outcomes in human digestive system material of grade V students of SDN Kalibanteng Kidul 01. This research uses the Research and Development method with the ADDIE development model. The instruments used are questionnaires and test questions. Product validity tests are carried out by material and media experts. The results of this research are: AR-Book development design as a learning medium; media notability of AR-Books by 90% media experts and 92% of materials rated "very valid"; teacher and student responses to AR-Book were "very interesting" with a percentage of teachers 92% and students 93.7%; The effectiveness of the media from the t test results showed a GIS (2-tailed) value of  $0.000 < 0.05$  which means there is a significant difference from the average results before treatment and after treatment and the N-Gain test which shows a value of 0.71 which means there is a significant increase in the high category. Thus, it can be concluded that the AR-Book media is very valid, very interesting, and effective for improving the learning outcomes of grade V elementary school students.

**Keywords:** Augmented Reality Book (AR-Book); Digestive system; Learning media; Learning outcomes

## Introduction

Learning is a process that involves interaction between students, teachers, and learning resources. Regulation of the Minister of Education, Culture, Research, and Technology of the Republic of Indonesia Number 16 of 2022 concerning Process Standards in Childhood Education. Early Morning, Primary Education Level, and Secondary Education Level reads "The implementation of learning as point b is held in a learning atmosphere that is interactive, inspiring, fun, challenging, motivates Students to participate actively and provides sufficient space for initiative, creativity, independence in accordance with the talents, interests, and physical and psychological development of

Students (Unesa, 2022). Based on the above government regulations, a teacher should carry out an interesting and fun learning process. Creative teaching methods are needed so that they can bring joy and high enthusiasm to every student (Taqiyyah et al., 2023). In addition, to carry out an interesting, fun and interactive learning process teachers can take advantage of learning media.

Learning media is needed by teachers to help deliver a material. Learning media is an important component in the teaching and learning process because it is used as a learning tool that can improve the quality of the learning process (Fitri et al., 2023). Media Learning can help the teaching and learning process so that the meaning of the message conveyed becomes clearer and the objectives of education or learning can be achieved

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effectively and efficiently (Ibrahim et al., 2023). The presence of learning media is very important because they help reduce the ambiguity of the material taught during learning activities. The complexity of the material delivered can be simplified with the help of learning media (Al Fatah et al., 2019). The use of learning media in the educational process has an impact on children's psychology (Faiza et al., 2022). Then learning media can also foster interest in learning, increase motivation, and stimulate students in learning activities (Putra & Ishartiwi, 2015). Nurrita (2018) it also states that learning media can improve learning experiences, learning motivation, and student learning outcomes. Effective learning media will determine the delivery of learning information well or not to students which will later affect student learning outcomes (Tasrif et al., 2020). From the opinion above, it can be concluded that learning media affects the efficiency and effectiveness of the learning process and increases student understanding of the material so that learning outcomes can increase.

Learning media that utilize modern information and communication technology, become a promising factor in the success of a learning process. The 21st century is a century that is closely related to globalization and information technology. The 21st century also leads to learning that equips students with various skills, including the 4Cs of Communication, Collaboration, Critical Thinking and Problem Solving, and Creative and Innovative (Putra et al., 2023; Siagian, 2022). Basically, technology is the use of science to meet the needs of society (Patonah, 2019). With the development of science and technology, teachers must make efforts to update the use of learning media in schools. They must be able to create new ideas that can support learning success (Atut et al., 2023).

To harmonize the use of technology and information in learning, a teacher needs to understand and have TPACK capabilities. TPACK is a complex and interconnected framework of Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK), which is used to create situational and active learning activities (Kartika et al., 2023). Pedagogical Content And Knowledge (TPACK) technology is an effective learning method because it combines technology, content, pedagogic, and knowledge (Anggrayni & Wiwik Okta Susilawati, 2023). TPACK is a system capable of using technology to present pedagogical concepts and techniques in a constructive way to teach content (Nurhasanah & Usman, 2023). TPACK is also able to use technology to solve problems and improve knowledge transformation, considering student characteristics, classroom conditions and learning institutions, situational teaching activities, and epistemological beliefs of teachers.

Therefore, it can be concluded that TPACK is a framework to describe the type of knowledge needed by teachers to improve learning practices and understanding of concepts by incorporating technology into the learning environment.

One form of technological development in learning media that can be associated with TPACK is the use of smartphones as a learning medium. The presence of technology, especially smartphones which are now growing, brings great opportunities to develop useful educational technology. Use Smartphones in the classroom can facilitate communication and collaboration between students and between students and teachers (Green, 2019). The development of technology in the world of education as it is now, teachers and students can search and find various information about knowledge quickly through smartphones that have an internet network (Ratminingsih & Budasi, 2020).

The development of technology used to make learning media is intended so that the media made becomes more interesting and more concise but does not reduce the essence of the material. The use of technology provides many benefits in learning, including stimulating, strengthening, and motivating students in learning (Hochberg et al., 2018; Ubben et al., 2023). Smartphones Have extraordinary abilities in solving problems in learning activities, especially overcoming mastery of concepts, critical thinking, and digital literacy of students (Wardani & Widodo, 2024). In addition, the use of smartphones as a learning medium can improve students' HOTS skills (Ali & Zaini, 2023). One of the developments of TPACK-based learning media that utilizes technological developments is the use of smartphones. PThe use of smartphones can make students understand the material more deeply so that learning is more meaningful (Rosidah et al., 2021; Susanto et al., 2022). But in fact in the field the use of smartphones has not been optimal and consistent in supporting learning (Meisaroh, 2024). Therefore, it is necessary to direct the use of smartphones to access learning resources and media so that their usefulness is higher. One of them is the use of smartphones to access Augmented Reality (AR) media.

Augmented Reality (AR) is a way to explore 3D objects and data. Augmented Reality is a concept that combines virtual reality with real reality (Chen et al., 2019). In Augmented Reality, 2-dimensional or 3-dimensional virtual objects will be projected until they look natural and blend with the real world (Billinghurst et al., 2015). In AR technology, users can see nature by visualizing objects in 3D, text, images, video, and audio in real-time. The use of Augmented Reality (AR) as an interactive learning medium can stimulate students' mindsets in critical thinking because AR can visualize

abstract concepts for the understanding and structure of an object model (Poerwanti & Budiharto, 2020; Cynthia et al., 2023).

Use Augmented Reality (AR) as a learning medium can attract students' interest and motivate them to learn (Dewi & Sahrina, 2021). In addition, AR also helps students to understand concepts and theories, stimulates students to think conceptually and feel 3D, improves images (representations) and perceptions, creates an interactive and attractive learning atmosphere and is more fun (Ivanova, 2017; Qumillaila et al., 2017). The learning process should also provide more space for students to develop creativity and independence, according to their talents and interests (Ashari et al., 2022). Therefore, the use of learning media in teaching science subjects is not only an effort to help teachers, but also help students in the learning process so that they can get interactive, fun, challenging, motivating, and direct experience. Because actually Students are no longer just objects of learning but they are also subjects of learning (Agustina et al., 2022).

Rev. et al. (2020) states that in relation to science subjects, the use of media should be implemented. First, the structure and content of science are full of abstract concepts and principles, so that the media can concretize these abstractions in accordance with the cognitive abilities of elementary school children who are still operational-concrete. Secondly, given that natural phenomena are SD IPA platforms, science materials are supposed to be simple and practical, which can only be communicated if used correctly. Therefore, from some of the basics and foundations above, the innovation of learning media by combining augmented reality technology in the form of developing learning media based on Augmented Reality Book (AR-Book). AR-Book is the merging of ordinary books with Augmented Reality (AR) technology (Kamiana et al., 2019). AR-Book is a development of Augmented Reality technology that combines literacy works with ancient findings displayed in 3D images through an android application (Bashofi, 2021). The use of Augmented Reality Book (AR-Book)-based learning media in the learning process plays a positive role in developing better thinking and understanding of concepts in learning, especially science learning (Luckyhasnita et al., 2021; Wahyu et al., 2020).

Observations at SDN Kalibanteng Kidul 01 revealed the problem of lack of learning media updates and innovations. Actually, teachers have used technology-based learning media such as animated videos and online quizzes during the learning process and the implementation of evaluations. However, the use of media that is too frequent causes students to feel bored, so that the function of learning media is not effective so that the result obtained is a lack of student understanding of the material.

Based on the information the researchers collected, it was found that 31 students in grade V of SD Negeri Kalibanteng Kidul 01 with Learning Goal Attainment Criteria (KKTP) of 75. The highest average daily test was 85 and the lowest average daily test was 37, the highest midterm summative was 92 and the lowest midterm summative was 25, and the highest final grade was 89 and the lowest final grade was 33. Then of the 31 students who did the midterm summative, only 10 students scored above KKTP, 2 students scored according to KKTP, and 19 other students were still below KKTP. From the data above, it can be concluded that science subjects, especially science (Natural Sciences), have low learning outcomes.

After the researchers observed, it turned out that most students viewed science as a difficult learning, so the test scores were substandard. The solution to the latest problem, namely through the development of Augmented Reality Book (AR-Book) media, especially on the material of the human digestive system. AR-Book media of the human digestive system is a book equipped with materials, images, barcodes of human digestive organs, barcodes of human digestive disorders, trying activities, and practice questions. The Augmented Reality feature available inside the barcode can be accessed with the Assemblr Edu app and the Google Lens feature. With this AR-Book media, it is hoped that teachers can more easily deliver material and increase student participation in participating in learning activities.

This research is reinforced by several previous relevant studies, including Research conducted Usmaedi et al. (2020) in his research entitled "Development of Technology-Based Learning Media Augmented Reality Applications in Improving the Teaching Process of Elementary School Students". This research shows that there is an increase in the learning process through Augmented Reality media. The Effectiveness of Augmented Reality Book to Improve Critical Thinking Ability at Elementary School Students" proved that there was an increase in student learning motivation, curiosity, and critical thinking skills in the use of Augmented Reality Book-based learning media. Saputra & Ulya (2023) in his research entitled "Development of Augmented Reality-Based Learning Media in Class IV Science Learning at SDN 18 Muara Tebo, Tebo Regency" shows that student learning outcomes have improved through the development of Augmented Reality media in the learning process. Research conducted by Silviana et al. (2023) entitled "Development of Augmented Reality Card Media with My Cultural Rich Indonesian Material in Class IV Science Learning" explained that the use of Augmented Reality media in learning can increase student interest and enthusiasm. In addition, there are studies conducted

by Rahmawati & Sandi Budiana (2023) in his research entitled "Improving Student Science Learning Outcomes through TPACK Approach Assisted by Augmented Reality Media Class V Elementary School". This research proves that there is an increase in student learning outcomes in science subjects through the application of the TPACK approach assisted by Augmented Reality media.

Previous research findings show that Augmented Reality media has a positive impact on the process and outcome of learning. Based on this, the development of Augmented Reality media for students in elementary schools needs to be studied more deeply so that its use can be more effective in accordance with the needs of teachers and students, especially in terms of practicality of using learning media and the level of student understanding.

Based on this background, researchers will discuss three problem formulations, including: the design of the Human Digestive System AR-Book media, the feasibility of the Human Digestive System AR-Book media and the effectiveness of the Human Digestive System AR-Book media. learning media to improve science learning outcomes of grade V students of SDN Kalibanteng Kidul 01.

**Method**

The research method used in this study is RnD (Research and Development). This research is a research process used to develop existing products and produce products that can be accounted for. Development research is the scientific process of studying, designing, manufacturing, and testing the effectiveness of the products produced (Sugiyono, Sutarnan, 2019). This research development procedure uses the ADDIE model research and development model. According to Rayanto (2020) the ADDIE model is in the form of a study or analysis of the relationships that exist between the various parts owned in coordination with the existing stages. Then according to (Branch, 2009) The R&D research method with the ADDIE approach has 5 procedure steps, namely Analyze, Design, Develop, Implement, and Evaluate.

The research subjects of small-scale product trials amounted to six students selected by purposive sampling techniques, while for large-scale product trials, there were 31 students. The total population of class V is 31 students. The independent variable in this study was the media AR-Book Human Digestive System. The dependent variable is student learning outcomes.

The research procedure used is to develop AR-Book learning media for the human digestive system, in the development assessment process which is the main

series in the form of teacher response assessment which is then used as a benchmark for the success of product development.

Analysis of the Teacher and Student Needs Questionnaire using the Guttman scale with yes or no answer choices. The range of scale values used is a value of 1 (yes) and a value of 0 (no). The formula used is as Formula 1 (Arikunto, 2018).

$$P = \frac{\sum x}{\sum xi} \times 100 \tag{1}$$

Information:

P = Score percentage

$\sum x$  = number of respondents' answer scores in one Items

$\sum xi$  = number of ideal scores in one item

**Table 1.** Criteria for Teacher and Student Needs Questionnaire (Arikunto, 2018)

Percentage (%)	Criteria
81 - 100	Totally agree
61 - 80	Agree
41 - 60	Disagree less
21 - 40	Disagree
0 - 20	Strongly disagree

Analysis of teacher responses to media using the Likert scale there are 5 categories used, namely 1 (very uninteresting), 2 (not interesting), 3 (quite interesting), 4 (interesting), and 5 (very interesting). The formula used Formula 2 (Akbar, 2022).

$$V - pg = \frac{TSe}{TSh} \times 100\% \tag{2}$$

Information:

V-pg : User Validation

Tse : Total empirical score achieved

TSh : Total expected score

**Table 2.** Teacher Response Questionnaire Criteria (Wulandari et al., 2020)

Score Percentage (%)	Criteria
85 - 100	Very interesting
69 - 84	Pull
53 - 68	Quite interesting
37 - 52	Less attractive
20 - 36	Unattractive

The questionnaire of students' responses to the media used the Guttman scale with 2 answer choices, namely a score of 1 (agree) and a score of 0 (disagree). The formula used Formula 3 (Akbar, 2022).

$$V - pg = \frac{TSe}{TSh} \times 100\% \tag{3}$$



Information:

- V-pg : User Validation
- Tse : Total empirical score achieved
- TSh : Total expected score

**Table 3.** Student Response Questionnaire Criteria (Wulandari et al., 2020)

Score Percentage (%)	Criteria
81 - 100	Very interesting
61 - 80	Pull
41 - 60	Quite interesting
21 - 40	Less attractive
0 - 20	Unattractive

The effectiveness of student learning outcomes can be done by analyzing student cognitive learning outcomes by calculating the scores that students have obtained and testing the results before treatment and results after treatment. The initial data analysis consists of a normality test. The normality test was used in this study to determine whether the data was normally distributed or not. According to Priyatno (2018), it is important to perform a data normality test because normally distributed data can be representative of the population. In this study, researchers used a normality test with Kolmogorov-Smirnov on SPSS version 26 to see whether the data was normally distributed or not.

**Table 4.** Normality Test Test Criteria (Priyatno, 2018)

Result	Information
If the significance value is $0.05 \leq$	Ho was rejected
If the significance value $> 0.05$	Ho accepted

The final data analysis consisted of paired samples test, T-Test, and N-Gain Test. Paired Samples Test T-Test or paired sample t test is performed to determine the average difference test between two paired samples. Priyatno (2018) stated that paired samples were used in sample groups that included the same subject but underwent two different treatments, such as before and after treatment. In this study, researchers used SPSS version 26 to test the results before treatment and the results after treatment with paired samples t-test. This t-test can be used on parametric normally distributed data.

**Table 5.** Test Testing Criteria Paired Samples T-Test (Priyatno, 2018)

Result	Information
If $-t \text{ calculate} -t \text{ table} \text{ or} \geq$	Ho accepted
$t \text{ calculate} t \text{ table} \leq$	
If $-t \text{ calculate} -t \text{ table} \text{ or} <$	Ho was rejected
$t \text{ calculate} t \text{ table} >$	

**Table 6.** Decision Making Based on the Significance of the Paired Samples T-Test

Result	Information
If the significance value is $0.05 \leq$	Ho accepted
If the significance value $> 0.05$	Ho was rejected

(Priyatno, 2018)

Then the gain index analysis is used to calculate the assessment between the pretest value and the post test value. In this study, the gain in question is normalized gain (N-gain). N-Gain is the normalization of gain obtained from comparing the difference between pretest and post test scores with the difference in Ideal Minimum Scores (SMI) and pretests in science lesson content after using AR-Book learning media Human Digestive System. The normalized gain Formula 1 (Lestari & Yudhanegara, 2015).

$$N - Gain = \frac{\text{Score posttest} - \text{score pretest}}{\text{Skor maksimal} - \text{score pretest}} \quad (4)$$

**Table 7.** Test Average Gain (N-Gain) (Lestari & Yudhanegara, 2015)

Interval	Criteria
N-Gain $0.7 \geq$	Tall
$0.3 \text{ N-Gain} 0.7 \leq$	Keep
N-Gain $< 0.3$	Low

## Results and Discussion

Research on the development of AR-Book Human Digestive System media to improve the learning outcomes of grade V students of SDN Kalibanteng Kidul 01 examines several things, namely; the results of the development of the Human Digestive System AR-Book, the feasibility assessment of the Human Digestive System AR-Book media, and the effectiveness of the Human Digestive System AR-Book on the learning outcomes of grade V students.

### Product data analysis

#### Analysis of Teacher and Student Needs Questionnaire

Table 8 Show results questionnaire of teacher and student needs. It was found that the average result of the questionnaire of teacher and student needs for the development of AR-Book media for the Human Digestive System was 79.5% and entered the criteria of strongly agreeing (Arikunto, 2018).

**Table 8.** Results of the Teacher and Student Needs Questionnaire

Parameter	Percentage (%)
Teacher	84
Student	91
Average	87.5%

*Analysis of Teacher and Student Responses to Media*

The results of the teacher's response to the AR-Book media Human Digestive System fall into the criteria of "very interesting" with a little suggestion to increase the size of the book and can be developed on other materials.

**Table 9.** Results of the Teacher Response Questionnaire

Class	Result
Class V A Teacher	90%

**Table 10.** Student Response Questionnaire Results

Class	Sum	Result
Class V A	31 Students	93.7%

The results of student responses to the Human Digestive System AR-Book media can be seen from the results of student response questionnaires. The results of the responses from these students were obtained from large group trial activities. The results of the student response questionnaire got a percentage of 93.7% so that it was included in the "very interesting" criteria. This is in accordance with the opinion that says that The interactive science media developed is able to make learning more interesting (Festiyed et al., 2023; Utamingsih et al., 2023). Based on student responses, it is stated that the AR-Book Human Digestive System

**Table 11.** Normality Test Results in Large Group Tests

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	Df	Sig.	Statistics	Df	Sig.
Pre	0.145	31	0.095	0.963	31	0.345
Post	0.123	31	0.200*	0.967	31	0.442

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

*Final Data Analysis*

Table 12 shows t-test results in large group trials. The criteria for paired sample t-tast testing is that if the sig value (2-tailed) > 0.05, there is no significant difference in pretest and posttest learning outcomes. It can be seen in the table that sig (2-tailed) 0.000 < 0.05 so

**Table 12.** T-Test Results on Limited Trials

		Mean	Std. Deviation	Std. Error Mean	Paired Differences		t	Df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre - Post	-38.710	7.955	1.429	-41.628	-35.792	-27.094	30	.000

*N-Gain Test*

The average improvement test is performed to determine the average increase before treatment and after treatment. Calculation of the average increase in

media makes students feel happy when learning and can understand the material more easily.

*Initial Data Analysis*

The normality test is carried out to determine whether the pretest and posttest learning results are distributed normally or not. The normality test can help researchers to be able to determine the data analysis technique to be used from the data obtained. Normally distributed data will use parametric statistical techniques. The normality test is performed using the Shapiro-wilki test formula with the help of SPSS version 26 application.

*Normality Test*

Table 11 shows the results of the normality test in large group test activities. Based on the output table on the Shapiro-Wilk sig column. For values before treatment 0.345 > 0.05 and values after treatment 0.442 > 0.05. Both values are greater than 0.05, so it can be concluded that the two values are normally distributed, thus the requirements for the paired sample t-test are met. Because the results of the normality test show normally distributed data, the t-test can be carried out. The results of the t-test were obtained from the results of data before treatment and after treatment processed through SPSS 23.

that it can be concluded that there is a significant difference between pretest and posttest results in large groups. Thus, AR-Book media can make improvements to student learning outcomes on human digestive system material.

values before treatment and after treatment using the N-Gain analysis technique. N-Gain is a normalized gain obtained by comparing the difference in scores before treatment and after treatment with the difference in SMI

and before treatment. Gain is the average increase in learning outcomes on presentation material and data

collection after the use of AR-Book Human Digestive System media.

**Table 13.** N-gain test results in large group trials

Parameters	N	Minimum	Maximum	Mean	Std. Deviation
NGain	31	0.43	1.00	0.7112	0.15358
Valid N (listwise)	31				

Based on the calculation of the average increase test (N-Gain) in large group trials, it is known that there is an average increase of 0.71 which is included in the high criteria. Details regarding the results of the study are presented in the description.

*The Development Needs of AR-Book Media Human Digestive System*

Information on the problem was obtained through observations and interviews conducted in class V of SDN Kalibanteng Kidul 01. It is known that students feel bored and less interested in learning a learning topic. In addition, some learning media used by teachers during learning are actually technology-based such as animated videos and online quizzes. But because the frequency of use that has been too often causes boredom to students so that the media does not help students in understanding learning material. From the findings above, the data is used as a reference to create AR-Book Human Digestive System media that motivates students to learn and increase understanding.

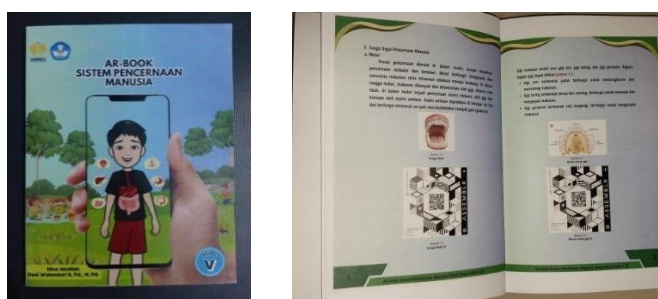
*Data Collection*

In this AR-Book Human Digestive System media development research, researchers used two types of data, namely qualitative and quantitative data. Qualitative data were obtained through observation, interviews, documentation, teacher and student needs questionnaires and teacher and student response questionnaires to the media. Then quantitative data were obtained through validation questionnaires of media experts and material experts, as well as data on improving student learning outcomes before media use and after media use through pretest and posttest activities of VA class students at SDN Kalibanteng Kidul 01, which were calculated by normality tests, t-tests and n-gain tests using SPSS version 26.

*Initial Product Development*

The design of the development of the Augmented Reality Book (AR-Book) to improve learning outcomes on the Human Digestive System material is designed based on the results of questionnaires on teacher and student needs and developed with learning objectives contained in the independent curriculum and tailored to student needs. The steps for making the AR-Book design of the Human Digestive System are divided into several

stages, including: Determining the material and reviewing the learning outcomes and learning objectives to be achieved in grade V Elementary School; Making AR-Book media prototypes; Creating barcodes containing markers of human digestive organs and human digestive disorders through the Assemblr Edu Web application; Looking for digestive system material that suits grade V students Elementary school and independent curriculum; Create book designs with the Canva application ranging from covers, backgrounds, animations, and attractive coloring according to student needs; Compile the entire book by including barcodes and human digestive system materials according to the systematic provisions of the book with the Canva application; and Print AR-Book Human Digestive System.



**Figure 1.** Display of AR-Book Media: (a) Cover; and (b) contents

Barcodes containing markers of human digestive organs and human digestive disorders on the Human Digestive System AR-Book media are made through the Assemblr Edu Web application which can be accessed via <https://studio.assemblrworld.com/explore>. Then for book design and editing is done using the Canva application to create an attractive book look with a combination of appropriate colors. The output of the AR-Book media Human Digestive System is in the form of a concrete book product equipped with Augmented Reality (AR) features. The comic product can be seen in Figure 1.

The output of the AR-Book media Human Digestive System is in the form of a concrete book product equipped with Augmented Reality (AR) features. This Human Digestive System AR-Book media

is also equipped with a barcode that can direct readers to access online both in the form of flipbooks and Pdf.



Figure 2. Ar-Book Barcodes

#### Product Validation

Based on calculations using the validity formula, the average value of media and material validation is obtained with a percentage of 91% so that according to the validity criteria table, the final value of AR-Book media validation of the Human Digestive System is included in the range of 85% - 100% values with a very valid validation level.

Table 14. AR-Book Due Diligence Results

Validators	Score Percentage (%)	Criterion
Media	92	Very valid
Material	90	Very valid
Average (%)	91	Very valid

#### Small Group Trials

The small group test subjects were students of class VB SDN Kalibanteng Kidul 01. The samples tested in small groups were taken by purposive sampling technique by considering students' comprehension abilities, namely 2 students with the upper rank, 2 students with the middle rank, and 2 students with the lower rank. The purpose of the small group trial was to see the practicality, readiness, and response of using the Human Digestive System AR-Book media (Poerwanti & Budiharto, 2020). In the process, students are welcome to try using AR-Book media, especially the use of Augmented Reality features. Students are directed to access barcodes with the Assemblr Edu app. In its implementation, students successfully accessed the AR feature and saw a good response which was marked by student enthusiasm during the use of AR-Book Human Digestive System media. The good response of students is evident from the results of the student response questionnaire obtained by 97.4% and entered the criteria is very interesting.

#### Large Group Trials

The subjects of the large group of research were students of the VA class of SDN Kalibanteng Kidul 01 which amounted to 31 students. In its implementation, researchers carried out two learning meetings. The first

meeting was held pretest and the second meeting was held posttest. In the process of large group trials, students are welcome to do the pretest first. Continued with the learning process which is divided into two meetings, at each meeting students are directed to use the Human Digestive System AR-Book media, especially the Augmented Reality (AR) feature which can be accessed by scanning barcodes through the Assemblr Edu application. Then the results of student responses to the AR-Book media of the Human Digestive system can be seen from the results of student response questionnaires. It was found that the average result of student response in large group trials was 93.4%, so it was included in the very interesting criteria.

#### Conclusion

Based on the results of research and development of AR-Book learning media Human Digestive System, it was found that media feasibility based on validation from media experts was 92% and validation from material experts was 90%, the average score of both expert validation values obtained a percentage of 91% stating AR-Book media Human Digestive system developed in very valid criteria. The results of the teacher response questionnaire were 90% with a very interesting category and the results of the student questionnaire were 93.7% with a very interesting category. Based on these results, it shows that the response to use (teachers and students) is very good when carrying out the learning process using the AR-Book learning media Human Digestive System. The results of paired t-test analysis showed sig (2-tailed)  $0.000 < 0.05$  and N-gain results showed a value of 0.71. From these data, it can be said that there has been a significant increase in the high category. Based on the results of research and development, it can be concluded that the Human Digestive System AR-Book media is very valid, very interesting, and effective for improving the learning outcomes of grade V elementary school students. Then the development of learning media in this study is limited to only one material, namely the material of the human digestive system, it is recommended that further researchers can develop the content of the material on the AR-Book media that is developed so that it is not limited and can be wider in scope so that it can increase knowledge and make improvements to student learning outcomes in science subjects.

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### Author's Contributions

Principal investigator and author of the article, D.A.; collecting data, D.A.; create needs questionnaire and response questionnaire instruments, D.A; make media validation assessments and material expert validations, D.A.; make an evaluation, D.A.; Developing and testing research products, D.A.; data processing and author of draft articles, D.A. Researcher and author of both articles, D.W; validate the instrument and validate the initial design of the product before going to the media expert validator and materials expert, D.W; supervisor who guided and directed the first author, D.W.

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