

Augmented Reality-Assisted Scrapbook Media Development in Natural and Social Science Learning

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Abstract: Natural and Social Sciences (known with IPAS) learning at the elementary school level still has many obstacles and shortcomings which impact student learning outcomes. This research is Research and Development referring to the Borg and Gall model with the aim of developing and testing the feasibility, practicality and effectiveness scrapbook media assisted by augmented reality. The population in this study was 35 people with 12 small-scale test subjects in class IVA students and 23 large-scale test subjects in class IVB at Public Elementary School (SDN) 1 Lambur. Data collection was carried out using test techniques (pretest-posttest) as well as non-tests in the form of observations, interview results, questionnaires and document data. The validation results by material, media and language expert validators show that scrapbook media assisted by augmented reality has met the valid criteria. Based on the pretest-posttest results, it is known that scrapbook media assisted by augmented reality is effective in improving student learning outcomes with an increase in the average pretest and posttest scores and the results of the N-gain test obtained $\langle g \rangle$ a gain value of 0.67 in the medium category. Based on the results of the response questionnaire distributed, a very positive response was obtained from teachers and students. From these results it can be concluded that scrapbook media assisted by augmented reality is effective for improving science and science learning outcomes and feasible and practical for use in class IV learning at SDN 1 Lambur.

Keywords: Augmented Reality; Five senses; IPAS; Scrapbooks

Introduction

In the Decree of the Minister of Education, Culture, Research and Technology of the Republic of Indonesia Number 56 of 2022, the government has established an independent curriculum where the essence of learning activities is play which is the embodiment of "Freedom to Learn, Freedom to Play" so that learning activities must provide a fun and meaningful experience for children, it is supported by the use of real learning resources, where learning resources that are not actually available can be provided through technology or children's reading books. One of the mandatory learning content contained in the independent curriculum is science which has now become IPAS (Natural and Social Sciences) as a combination of natural and social sciences subjects to form Natural and Social Sciences (IPAS) (Wijayanti and Akantini, 2023; Sugih et al., 2023)

However, these hopes have not been fully realized. In the learning process, the teacher only explains the

material without involving students so that students do not have direct experience in learning and this results in a low level of student completion (Niland et al., 2020; Nur Jannah, 2020; Wahyu et al., 2020). Another problem is that many educators still have difficulty finding the right media to use in learning and adapting the material to the learning media (Putri & Ardi, 2021; Ramadhina & Rohman, 2022; Utami et al., 2021; Winda & Dafit, 2021). Apart from that, it can also be said that teacher creativity and technology optimization in implementing learning are still lacking (Sulastris et al., 2020).

From these various obstacles and problems, Public Elementary School (known with SDN) 1 Lambur researchers also found several similar obstacles. From the results of observations and interviews that have been conducted, no innovation or use of learning media has been found. The results of the questionnaire that was distributed to fourth grade students at SDN 1 Lambur provide an illustration that there are still many students who are not interested and find the science and science

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subject content difficult. From the results of the questionnaire regarding preferred subjects, it was found that 27.2% of students liked Mathematics, 45.4% of students liked Fine Arts, 18.1% of students liked Indonesian, 9% of students liked Sports, and 0% of students liked Science. This means that there is no great interest from students in studying and participating in science lessons. Apart from that, existing technology is not used optimally. Facilities such as Wi-Fi, computer laboratories, LCDs and projectors in schools are underutilized in the learning process because they are only used at certain moments, even though they are occasionally used in learning. The availability of cellphones that students have has also not been maximized. From the results of the questionnaire, 91.6% of students already have their own cellphones, all of which are Android with 22.7% of students using them for studying, 31.8% for YouTube and social media, and 45.5% of students using them for playing games. This means that 77.3% of students have not used their cellphones properly for studying, so this has an impact on student learning outcomes in the science and science subject content at SDN 1 Lambur, where 57% of students have not met the completion standards with a minimum completion score of 76.

The development of creative, innovative learning media that creates students' interest in learning, as well as the development of technology-based media can be a solution to overcome the various problems mentioned above. The existence of learning media can increase students' learning motivation (Antara & Dewantara, 2022; Dwi Cahyani et al., 2021; Nur Jannah, 2020; Rahmawati & Tirtayani, 2021). The role of media is also very necessary so that students understand the material more easily (Nur Jannah, 2020; Ramadhina & Rohman, 2022; Wahyu et al., 2020; Winda & Dafit, 2021). One of the media that can be used in learning science and science is a scrapbook. Therefore, researchers will develop the scrapbook media in digital form or e-scrapbook. E-scrapbook media is a digital-based learning media in the form of an electronic book (e-book) which contains explanations of learning material presented with pictures/decoration that can attract students' attention and make it easier for students to understand the material when studying (Purwatiningsih, 2020; Wusqo, Pamelasari, et al., 2021). The results of previous research show that the e-scrapbook learning media for elementary schools that was developed is valid and practically applied in learning and can increase students' interest in learning and understanding of concepts (Antara & Dewantara, 2022; Arum et al., 2023; Dwi Cahyani et al., 2021; Gede et al., 2022; Wusqo, Pamelasari, et al., 2021)

The novelty of the media that the researchers developed is the e-scrapbook media packaged in the

form of an application which contains five-sensory material for grade IV elementary school with the integration of augmented reality technology at several points in the five-sensory material. Augmented reality is a resource that has a series of intrinsic characteristics that favor its inclusion and use in the educational field because it is an interesting, fun, dynamic and versatile teaching tool (Afnan et al., 2021; Almenara et al., 2020; Moreno-Fernández et al., 2023). The presence of augmented reality as part of learning media has been proven to improve students' learning experiences in science subjects (Drljević et al., 2022; Khazali et al., 2023; Ridzuan et al., 2022; Wen et al., 2023) and able to balance student learning outcomes with the learning skills needed for the 21st century (Wen et al., 2023).

Based on these various backgrounds, researchers conducted research regarding the development of scrapbook learning media assisted by augmented reality to improve the learning outcomes of class IV students in science and science lesson content with sensory material at SDN 1 Lambur. The aim of this research and development is to test the feasibility, practicality and effectiveness of the product being developed, so it is hoped that this learning media can make it easier for students to study sensory material in class IV elementary school.

Method

The type of research that researchers use is Research & Development (R&D) research which will ultimately produce scrapbook learning media assisted by augmented reality in learning science and science material for grade IV elementary school. In research and development of this media, researchers implemented development according to the procedure developed by Sugiyono (2019) which consists of 10 steps, but in this research the researchers only limited it to step 8, namely trial use due to time and cost constraints. Therefore, the steps in this research consist of: (1) potential and problems; (2) collection of data or information; (3) product design; (4) design validation; (5) design revision; (6) product testing; (7) product revision; (8) trial use. The research scheme can be seen in Figure 1.

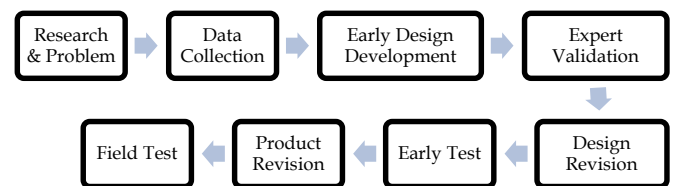


Figure 1. Modified from the Borg & Gall Model

The first stage is potential and problems to find out the potential and problems that exist in the school by conducting observations, interviews, and documenting

data for class IV SD N 1 Lambur. The next stage is collecting data to plan the product to be developed by distributing questionnaires to teacher and student needs and then analyzing them. After analyzing the data, the researchers then designed a product with a design tailored to the learning outcomes of the fourth grade elementary school science material material that they wanted to achieve, namely the learning outcomes of students analyzing the relationship between the shape and function of human body parts (five senses). After the product has been designed, the researcher validates the design with expert validators who are competent in their fields, in this case media experts, material experts and language experts by filling in a validation sheet in the form of a Likert scale.

The next stage is to revise the product design based on input from expert validators so that the product is ready to be tested. After the product was revised, the product was then tested on students on a small scale, namely in class IVA consisting of 12 students using purposive sampling techniques based on different levels of cognitive ability. At the product testing stage, learning was carried out using scrapbook media assisted by augmented reality. After learning is complete, the teacher and students then fill out a response questionnaire regarding media use which is then analyzed to be used as revision material if there are suggestions or input. The final stage is a large-scale product trial, namely in class IVB for the 2023/2024 academic year, totaling 23 students to determine the effectiveness of the product developed based on student learning outcomes.

The type of data that researchers use is primary data obtained directly during the research, consisting of qualitative and quantitative data. Qualitative data was obtained from observations, teacher interviews, and distributing questionnaires at SDN 1 Lambur. Quantitative data was obtained from the learning results of class IV students at SD N 1 Lambur on the science and science lesson content on the five sensory materials as well as the results of the pretest and posttest assessments. The research design that the researchers used was a pre-experimental design with a one group pretest-posttest design model, that is, there was a pretest before treatment was given and a posttest was carried out after the research to be able to know more precisely the results of the treatment because they could compare conditions before and after treatment (Sugiyono, 2019).

Data collection techniques use test techniques and non-test techniques. The test technique is in the form of 30 multiple choice questions and the non-test technique is in the form of observation, interviews, questionnaires and document data. To determine the feasibility of the product being developed, data analysis was carried out from the results of the expert validator assessment using

a Likert scale. To determine the practicality of the product, a student and teacher response questionnaire was used after using the product using a Likert scale. Then, to determine the effectiveness of the product, data analysis was carried out in the form of an N-gain test based on students' pretest and posttest scores in large-scale trials.

Results and Discussion

Potential and Problems

Based on the pre-research results, several problems were found, namely the lack of innovation and use of learning media and the lack of optimization of available learning facilities, in this case related to technology. Based on the results of the questionnaire that has been distributed, it is known that there is no interest from students in the content of the science course and find the science lesson difficult. In implementing learning, students still tend to be passive. Apart from that, in the results of learning the content of class IV science subjects at SD N 1 Lambur, it was found that 57% of students had not met the completion standards with a minimum completion score of 76.

Initial Data Collection

The researchers collected initial data by distributing questionnaires to teacher and student needs. Based on the results of data collection, it is known that the material contained in teacher and student books is still not extensive. Insufficient material needs for the teaching materials available in schools also mean that teachers have to search for and compile additional material themselves from other sources to complete it so that students' knowledge regarding the material can still be met. In learning, teachers are still not optimal in using learning media and utilizing available technology so that the goal of increasing student learning motivation and providing new learning experiences for students cannot be achieved. For this reason, it is necessary to develop learning media that can attract students' attention by choosing designs, colors and using images that can increase students' interest in learning. Because it is based on the results of a questionnaire where 91.6% of students already have their own cellphones, all of which are Android with 77.3% of students not using their cellphones properly for learning, this means that teachers also need technology-based learning media that can be used on cellphones. So that students can use their cellphones more for studying. Teachers also provide input to create learning media that is interactive and able to provide new experiences to students so that their understanding of the learning material can last longer. Therefore, the development of scrapbook learning media assisted by augmented reality with material that

is appropriate to the students' environment and the use of short and clear language so that the material is easy for students to understand is the answer to all existing problems.

Product Design

Scrapbook learning media assisted by augmented reality is designed according to the learning outcomes and objectives to be achieved in grade IV sensory material. This scrapbook is packaged with explanations of the material in it in the form of writing, images, animations, and integrated with augmented reality according to student characteristics so that it is easy to understand and can increase student learning motivation. This augmented reality-assisted scrapbook was created with the initial steps of preparing the materials, format and layout to be used, followed by creating a product design using several applications. For the scrapbook design, we used Adobe Illustrator, while the objects for augmented reality were created using Blender 3D. Lastly, combining scrapbooking and augmented reality, improving the design, and making changes to the application using Unity.

The final product of this learning media is an application that can be used without having to be connected to an internet network, but it still needs to be downloaded and installed first before using the internet network. This augmented reality-assisted scrapbook consists of a cover, application instructions, study instructions, concept map, let's discuss, learning outcomes, learning objectives, material explanation, conclusion, bibliography and author profile.



Figure 2. Cover Page

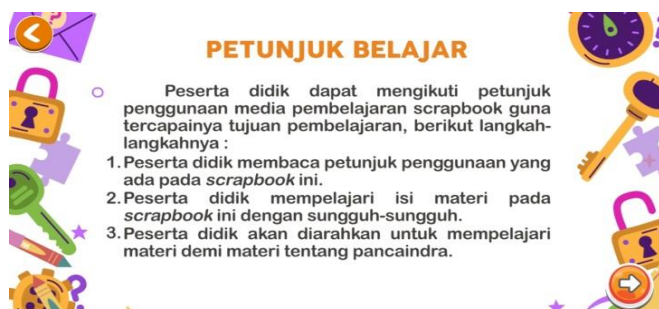


Figure 3. Study Guide



Figure 4. Material Content Points



Figure 5. Example of a Material Page

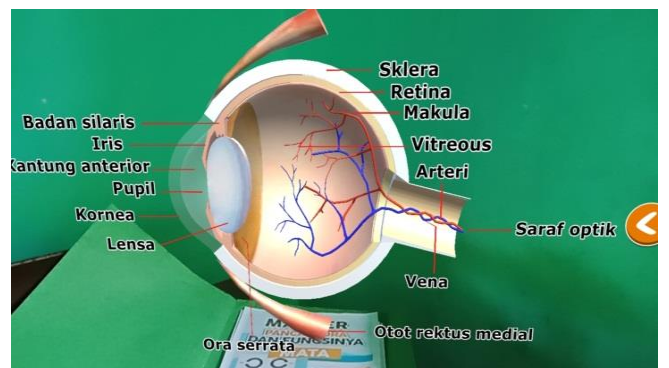


Figure 6. Example of an Augmented Reality Page

Product Eligibility

At this stage, researchers will validate the product with expert validators who are competent in their fields, including media experts, material experts and language experts to test the suitability of the product. After being assessed by the validator, there will be input regarding the product developed by the researcher so that the researcher can revise the product developed. Learning media will fall into the very appropriate criteria if the score is 76%-100%, adequate if it gets 51%-75%, quite decent if it gets 26%-50%, and not worthy if it gets 0-25%. A recapitulation of the validation results for each expert component is presented in Table 1.

Table 1. Results of Expert Validator Assessment of Augmented Reality Assisted Scrapbook Media

Fraction	Media Validator	Material Validator	Language Validator
Total score	71	57	48
Maximum Score	76	68	68
Percentage	93.4%	83.8%	70.6 %
Criteria	Very Worth It	Very Worth It	Worthy

Based on the results of the validator assessment presented in Table 1, the scrapbook assisted by augmented reality was declared valid in its entire content or material, appearance or media, and language and was ready to be tested in the field, but with several revisions.

Design Revision

After validation by experts, researchers revised the media according to suggestions from expert validators. There are no suggestions from media experts because according to media experts, this augmented reality-assisted scrapbook is already good and complete. Material experts provide suggestions, namely on adjusting learning scenarios, adapting augmented reality to the material, and replacing backgrounds and explanatory images to clarify the material presented. Linguist experts provide suggestions for improving writing in the explanation section, differentiating spoken and written sentences, re-checking conformity with the KBBI, and adapting the writing of the bibliography to the writing style of the American Psychological Association (APA).



Figure 7. Home Page Before Revision



Figure 8. Home Page After Revision

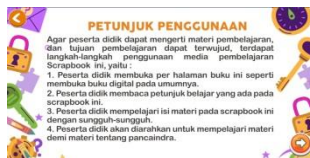


Figure 9. Study Guide Before Revision

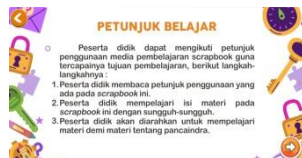


Figure 10. Study Guide After Revision



Figure 11. Writing Explanation of Material Before Revision



Figure 12. Writing Explanation of Material After Revision



Figure 13. Background Design Before Revision



Figure 14. Background Design After Revision



Figure 15. Image on the Material Explanation Page Before Revision



Figure 16. Image on the Material Explanation Page After Revision



Figure 17. Background Design Before Revision



Figure 18. Background Design After Revision



Figure 19. Image on the Material Explanation Page Before Revision



Figure 20. Image on the Material Explanation Page After Revision



Figure 21. Image on the Material Explanation Page Before Revision



Figure 22. Image on the Material Explanation Page After Revision



Figure 23. Background Design Before Revision



Figure 24. Background Design After Revision



Figure 25. Bibliography Before Revision



Figure 26. Bibliography After Revision

Augmented Reality Assisted Scrapbook Practicality (Product Trial)

The next step was to carry out product trials on a small scale using 12 class IVA students who were taken by heterogeneous selection based on students' ability levels, namely 4 students with top rankings, 4 students with middle rankings, and 4 students with lower rankings. After learning using scrapbook media assisted by augmented reality was completed, students and teachers were given a response questionnaire containing 19 questions with three aspects including content or material, media quality, and also language with a Likert scale that had to be filled in based on their experience when using the product that the researcher had provided. develop. The response questionnaire has assessment criteria, namely very positive criteria if the score is 76%-100%, positive if it is 51%-75%, negative if it is 26%-50%, and very negative if it is 0-25%.

Table 2.Results of Teacher and Student Responses to Augmented Reality Assisted Scrapbook Media in Small Scale Trials

Fraction	Teacher	Students (12 students)
Total score	76	874
Maximum Score	76	912
Percentage	100%	95.83%
Criteria	Very Positive	Very Positive

Table 2 shows that the results of teachers' and students' responses to scrapbook media assisted by augmented reality gave very positive results and there was no input from either teachers or students so that scrapbook media assisted by augmented reality could be practically used in learning activities. Due to the absence of suggestions and input from teachers and students and the results of the media response questionnaire including very positive criteria, there were no product revisions in small-scale trials.

Table 3.Results of Teacher and Student Responses to Augmented Reality-Assisted Scrapbook Media in Large-Scale Trials

Fraction	Teacher	Students (23 students)
Total score	76	1720
Maximum Score	76	1748
Percentage	100%	98.39%
Criteria	Very Positive	Very Positive

Table 3 shows that the results of teacher and student responses to scrapbook media assisted by augmented reality gave very positive results and there was no input from either teachers or students so that scrapbook media assisted by augmented reality could be practically used in learning activities.

Effectiveness of Augmented Reality Assisted Scrapbook Products Trial Use

Large-scale trials were carried out in class IVB with a total of 23 students using scrapbook media assisted by augmented reality in science and science lesson content with sensory material to determine the effectiveness of the product based on student learning outcomes. The research design that the researchers used was a pre-experimental design with a one group pretest-posttest design model, that is, there was a pretest before being given treatment and a posttest after being given treatment.

Table 4.Student Pretest and Posttest Results on Use Trial

Fraction	Average	Average Difference
Pretest	54.22	30
Posttest	84.22	

Based on table 4, it is known that the average student learning outcomes show an increase of 30 points in large-scale product trials so it can be concluded that there are differences in student learning outcomes in the science and science subject content for class IVB SD N 1 Lambur before and after using scrapbook media. assisted by augmented reality. To determine the criteria for increasing the average pretest and posttest, an N-gain analysis was carried out.

Table 5.N-gain Test Results

Average Difference	N-gain	Criteria
30	0.67	Currently

Based on Table 5, it is known that the average difference is 30 in large-scale product trials. This shows that the grades of class IVB students at SD N 1 Lambur have increased on average by 0.67, which is included in the medium criteria. This increase in average shows that the use of scrapbook media assisted by augmented reality used in learning science and science material for the five senses in class IVB SD N 1 Lambur has succeeded in improving student learning outcomes. This shows that scrapbooking media assisted by augmented reality is feasible and effective in implementing learning because it can improve student learning outcomes.

The results of data analysis show that scrapbook media assisted by augmented reality is suitable for use in learning science and science material for grade IV elementary schools. This feasibility is further strengthened by several factors.

First, the presence of scrapbook learning media contributes to increasing students' motivation to gain knowledge and experience using technology in 21st century learning, including making learning more enjoyable (Arum et al., 2023; Rahmawati & Tirtayani,

2021; Ridzuan et al., 2022). E-scrapbooks are present as a practical and innovative learning media and are able to increase students' interest in learning so that ultimately it also has an impact on improving their learning outcomes (Ardita & Anas, 2022; Dwi Cahyani et al., 2021; Gede et al., 2022). The existence of scrapbooks not only helps students during the learning process, but can also be used by them to learn independently so that indirectly scrapbooks can empower children who tend to be slow to learn at school (Nur Jannah, 2020; Wusqo, Khusniati, et al., 2021). The existence of augmented reality can also increase student learning success (Afnan et al., 2021; Khazali et al., 2023; Wen et al., 2023) and make it easier for students who have difficulty learning (Çetin & Ulusoy, 2023; Khazali et al., 2023).

Second, the use of scrapbook media helps students explore the essence of the basic concepts of the material taught by the teacher and can stimulate students' curiosity (Antara & Dewantara, 2022). Digital science scrapbooks as a learning tool will be able to make students interested in the learning process because they include learning material arranged with attractive designs, images or short videos that further clarify the material being taught (Wusqo, Pamelasari, et al., 2021).

Third, the integration of augmented reality in scrapbooks allows independent learning to occur and this has an impact on students' creative thinking skills which can improve significantly (Wen et al., 2023). Augmented reality is a new technology that is easy to use, stimulates formative scenarios that motivate and supports collaborative work so that it can indirectly increase student engagement during learning (Afnan et al., 2021; Almenara et al., 2020; Drljević et al., 2022; Lin et al., 2023; Wen et al., 2023).

Fourth, scrapbook media is a visual learning medium because it displays images that can attract students' reading interest (Dwi Cahyani et al., 2021; Wusqo, Khusniati, et al., 2021). Apart from increasing students' interest in reading, visual media is very important to learn because it functions to facilitate understanding and strengthen students' memory of the material taught by the teacher (Dwi Cahyani et al., 2021). Plus, augmented reality technology helps students to visualize objects and memorize them in an effective way (Khazali et al., 2023). In fact, from the results of research on Chinese elementary school students, the application of augmented reality in learning can improve students' spatial abilities (Supli & Yan, 2024), where spatial abilities are also important in learning science.

Lastly, this digital scrapbook media is very easy to carry and use anywhere and anytime (Rahmawati & Tirtayani, 2021; Wusqo, Pamelasari, et al., 2021).

The implication of this research is that the augmented reality assisted scrapbook media that researchers have developed can be used by teachers and

students in learning so that it can improve student learning outcomes. By aligning several previous studies with adjustments to conditions and problems in the field, the researchers developed scrapbook learning media assisted by augmented reality in the social sciences lesson content for grade IV elementary school. Based on the results of the research and discussion previously explained, the scrapbook learning media assisted by augmented reality is feasible and effective to be applied in learning.

Conclusion

The results of data analysis show that the augmented reality-assisted scrapbook learning media received very decent qualifications with an average score of 82.6% in the product validation assessment. The results of the response questionnaire to the media also provided a very positive category from teachers and students. Data analysis also shows that there is a significant difference in increase in students' pretest and posttest scores with an average difference of 30 and an N-gain of 0.67 which is included in the medium category. With this, the scrapbook learning media assisted by augmented reality has proven to be feasible, practical, and effective in improving student learning outcomes in science and science lesson content, material for the five senses in grade IV elementary school.

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Author Contributions

Fathin contributed to conducting research, developing products, analyzing data, and writing articles. Novi Setyasto as supervisor in research activities to article writing.

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Conflicts of Interest

The author declares that he has no conflict of interest.

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