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Development of "My Eyes" Learning Media to Improve Students' Understanding of the Eye and Its Functions

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ABSTRACT

This study aims to develop a concrete learning medium called "My Eyes" to improve fifth-grade elementary school students' understanding of the structure and functions of the human eye in the IPAS subject. The research employed a Research and Development (R&D) approach based on the stages proposed by Borg and Gall. The process began with a preliminary study conducted at SDIT Attasyakur, which revealed that the average pretest score was 35.94, with most students scoring below the minimum passing grade (KKM) of 75. The development process then proceeded through planning, initial product development, limited testing, revision, and extensive testing in three development schools. The test instrument was analyzed using a validity test (r-count > r-table 0.329) and the Kuder–Richardson reliability formula, resulting in a reliability coefficient (r11) greater than 0.70, indicating that the instrument was reliable. The feasibility of the media was evaluated through questionnaires administered to media experts (improving from 56% to 88% after revision), subject matter experts (87%), teachers (≥80%), and students (categorized as good to very good). The results of the paired-sample t-test involving 54 students showed that the average pretest score of 10.83 increased to 12.02. The t-count value of 12.399 exceeded the t-table value of 1.674 at α = 0.05, indicating a statistically significant difference between students' scores before and after using the media. The effectiveness analysis also showed an improvement of 18.28%. Therefore, the "My Eyes" learning media is considered feasible, practical, and effective as an instructional tool to enhance students' understanding of the structure and functions of the human eye in elementary science learning.

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INTRODUCTION

Merdeka Belajar Curriculum is a new curriculum implemented in Indonesia with the aim of improving the quality of education and preparing students to face future global challenges (Akbar et al., 2023; Hadi et al., 2023; Haq & Wakidi, 2024; Kamila & Rp, 2024). One of its primary focuses is the development of 21st-century skills, including environmental awareness and sustainability competencies. In the 2013 Curriculum and previous curricula, science and social studies were taught as separate subjects(Abidin et al., 2023; Amani K. H. Alghamdi, 2017; Setiawan & Suwandi, 2022; Sukartiningsih, 2016). However, considering the developmental psychology of elementary school children particularly during a critical period for cultivating inquiry skills the Merdeka Belajar Curriculum integrates Natural Sciences and Social Sciences into a single subject known as Natural and Social Sciences (IPAS)(Fannisa et al., 2023; Intisari et al., 2024; Rosmiati et al., 2022). This integration is intended to provide a more holistic learning experience, enabling students to develop critical thinking, inquiry skills, and a comprehensive understanding of real-world phenomena from both scientific and social perspectives.

A common problem in education is the weakness of the learning process (Chen & Wang, 2024; Vodovozov et al., 2021). In many classroom settings, students tend to learn predominantly at a theoretical level, with instruction focused mainly on understanding subject matter conceptually(Closs et al., 2022; Hussein & Csikos, 2023; Martin-alguacil et al., 2024) . However, the knowledge acquired often lacks practical application in everyday life. In the teaching and learning process, teachers are expected to facilitate the development of students' potential and creativity. Learning should not only emphasize theoretical mastery but also encourage students to apply their knowledge in real-life contexts(Hussein & Csikos, 2023; Zhang & Ma, 2023). Such an approach enables students to develop meaningful understanding and prepares them for future challenges.

My Eyes media is a specialized instructional tool designed to enhance students' understanding of the structure and functions of the human eye in science learning(Rawis et al., 2023). By incorporating simple simulations and experimental activities into the learning process, this media enables students to directly explore and comprehend how the eye functions. Such hands-on experiences can stimulate curiosity and increase student engagement(Kibga et al., 2021). Furthermore, the design of *My Eyes* media takes into account diverse learning styles, making the instructional process more inclusive. By integrating visual, kinesthetic, and interactive elements, the media supports varied learning preferences and promotes a more meaningful learning experience for students.

Furthermore, to reduce the learning burden on students, IPAS subject is introduced starting in Phase C at the elementary school level(Wulandari et al., 2023). In elementary school, this subject aims to develop students' basic scientific literacy. Its content provides a foundation for students to continue learning more complex natural and social sciences at the junior high school (SMP) level. The integration of science and social studies also increases the relevance of learning to real-life situations and helps develop important skills needed in the globalization era, such as critical thinking, communication, collaboration, and innovation(Wijanarko et al., 2022). In addition, this integration helps students understand the role of science in everyday life.

Learning media is an important element in the learning process(Charline et al., 2023). Its functions as a learning resource help teachers deliver material and enrich students' knowledge.

Teachers use different types of media to support students in understanding the lessons better. The use of learning media can increase students' interest in learning new topics and make it easier for them to understand the material presented(Adipu et al., 2023). Media that is attractive and appropriate can encourage students to be more active in the learning process(Sartika et al., 2024). Therefore, managing and selecting suitable learning media is important in formal education. Teachers need to choose media that match the learning objectives set by the school.

The learning conditions of IPAS subject in fifth grade of elementary school show that students have different levels of understanding(Lestari et al., 2024). Although many students are interested and enthusiastic about the subject, several challenges are still found. First, students have different learning speeds, so their understanding of the material varies. Some students can understand the material quickly, while others need more time. Second, the limited availability of attractive visual learning resources can reduce students' interest in learning IPAS. A learning approach that is less interactive or less engaging can also become a challenge in the classroom. Third, students often experience difficulty in understanding abstract material. Some IPAS topics, such as the structure and function of the eye, are abstract and not directly visible. This makes it difficult for some students to imagine or visualize the concepts clearly.

The challenges in IPAS learning are also supported by the evaluation results on the topic of the eye and its functions in fifth grade elementary school. Based on the learning outcomes document for the 2023/2024 academic year, many students have not yet reached the minimum completion criteria set by the school. This fact was obtained directly in the field through observations and interviews conducted by the authors with several teachers and homeroom teachers of Grade V in four elementary schools. The Minimum Learning Achievement Criteria (KKM) for science was set at 75. Based on interviews and observations at SDIT Attasyakur Depok, IPAS teachers still mainly used the lecture method in teaching. This method tended to make students passive, which affected their learning outcomes, especially on the topic of the eye and its functions. As a result, many students obtained scores below KKM. Out of 32 students, only 17 students (53.1%) achieved KKM, while 15 students (46.9%) had not yet reached the required standard.

This problem also occurs at SDIT Insan Madani, SDIT Nur Muria, and SDT Al-Farabi. Based on observations, learning activities in IPAS subject, especially on the topic of the eye and its functions, rarely involve observation activities or direct experiments. As a result, students tend to only listen to the teacher's explanation, memorize the material from textbooks, and answer questions without deeper understanding. In addition, teachers do not yet have structured *My Eyes* student worksheets that are suitable for the characteristics of the topic. Although the teaching methods used are considered adequate, they are still mostly conventional, with limited use of discussion and occasional singing activities while memorizing. The average student learning outcome in class is 71.875, with a maximum score of 100 and a minimum score of 10. This indicates that students' learning outcomes have not yet reached optimal levels, as the average score is still close to KKM, meaning that overall achievement remains moderate and needs improvement.

Based on the problems described above, the authors conclude that the background of this study includes: (1) teachers use learning media and teaching materials that are less varied in explaining the material; (2) teachers still predominantly use the lecture method; (3) in science learning, especially on the topic of the eye and its functions, the learning process is more teacher-centered, with teachers being more active than students; and (4) students show low

learning motivation. To address these problems, the authors conducted a study using the Research and Development (R&D) approach. In this research, *My Eyes* learning media was developed as a concrete instructional tool. The media is designed in the form of a three-dimensional inner eye model, complete with labelled parts and their functions. It uses attractive colors to capture students' attention and is made of gypsum material. *My Eyes* media is intended to be used in Grade V elementary school IPAS learning, particularly for the topic of understanding the eye and its functions. This media is proposed as one of the practical solutions to overcome learning problems in IPAS subject, specifically in teaching the topic of the eye and its functions.

Based on the description above, the researcher plans a study entitled **"Development of *My Eyes* Learning Media to Improve Students' Understanding of the Eye and Its Functions in Grade V Elementary School."** Through this study, it is expected that the problems faced by teachers, especially those related to teaching the topic of the eye and its functions, can be addressed more effectively.

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RESEARCH METHODOLOGY

This study is categorized as Research and Development (R&D)(Ricu Sidiq & Najuah, 2020). It aims to develop and test the feasibility and effectiveness of *My Eyes* media to improve students' understanding of the topic of the eye and its functions in Grade V at SDIT Attasyakur. This research does not only aim to produce an educational product, but also to examine the extent to which the product is acceptable and effective in improving students' understanding. The development model used in this study is Borg and Gall model, which consists of ten stages of product development. This model is considered appropriate because it provides systematic steps in designing, developing, testing, and revising educational products, especially to improve learning outcomes in elementary school science learning.

RESULTS AND DISCUSSION

1. Research and Initial Data Collection

In this stage, the authors identified a learning problem, which is students' low understanding of the topic of the eye and its functions. This was shown by the pretest results, which had an average score of 35.94%, and the large number of students who did not reach KKM. The authors conducted classroom observations, interviews with teachers, and document analysis to identify the teaching methods and media used in the classroom, such as lectures and singing activities. The findings showed that students still had difficulty naming and explaining the parts of the eye and their functions. This initial information became the basis for developing a concrete learning media. Based on these findings, it was concluded that a new learning media was needed, which is more interesting and easier for students to understand.

2. Planning

At the planning stage, the authors formulated the objective of the development, which was to produce *My Eyes* media to improve fifth-grade elementary school students' understanding of the topic of the eye and its functions. The authors prepared the initial product specifications, including the use of styrofoam material, an eyeball shape design, bright colors, and labeled parts of the eye. The authors also prepared research instruments

such as a test blueprint, pretest and posttest questions, validation sheets, and response questionnaires. In addition, the authors determined the trial subjects, namely fifth-grade students at the pilot school and the developer schools. A data analysis plan was also prepared, including validity testing, reliability testing, normality testing, t-test analysis, and effectiveness calculation. This stage ensured that the entire development process was carried out in a systematic and measurable way.

3. Development of the Initial Product (Product 1)

Based on the planning stage, the authors developed the initial form of *My Eyes* media (Product 1) in the form of a styrofoam model showing the internal anatomy of the human eye. The media was designed using bright colors (red, yellow, orange, turquoise, brown, and white) to attract students' attention. It was also equipped with labels of the eye parts that could be attached to the model. This initial product was designed to be easy to use and store. However, it still had some weaknesses, especially in terms of the durability of the material. At this stage, the authors also prepared validation instruments for material experts and media experts to evaluate the feasibility of the product. Product 1 served as the preliminary version to obtain feedback before conducting broader trials.

4. Initial Trial (Limited Trial) and Initial Revision

Product 1 was then tested through a limited trial at SDIT Attasyakur, involving media experts, material experts, teachers, and fifth-grade students. The media experts gave score of 23 points (66%), categorized as fair. They stated that the design was attractive, but the material was not durable enough and the color contrast needed improvement. The material experts gave score of 26 points (87%), categorized as good, and highlighted the completeness of the content, appropriate word choice, and suitability to students' intellectual level. Teachers gave score of 88%, and students gave approximately 79%, both categorized as good. These results indicate that the media was generally accepted but still required some improvements. Based on these findings, the authors prepared several revisions to improve the product before conducting the next stage of testing.

5. Product Revision (Product 2)

This stage focused on improving Product 1 based on feedback from experts and users. The authors replaced the material from styrofoam with gypsum to make the media stronger and more durable, so it would not be easily damaged during repeated use. The color design of the board and the eye illustration was also revised to provide better contrast and to be closer to the original colors, making it easier for students to recognize the parts of the eye. In addition, the media was redesigned into several detachable parts that could be assembled and disassembled, allowing students to view the model from different angles and gain a better learning experience. These revisions resulted in Product 2, which was visually and structurally more prepared for testing in the development schools.

6. Main Field Trial (Development Schools)

Product 2 was tested in three development schools: SDIT Insan Madani Islamic, SDIT Al-Farabi, and SDIT Nur Muria. The participants were fifth-grade teachers and students as

users of the media. The authors distributed questionnaires to teachers and students to evaluate the design, ease of use, safety, and usefulness of the media in IPAS learning, especially on the topic of the eye and its functions. The results of the teacher questionnaires showed scores of 80%, 91%, and 94%, which were categorized as very good. Meanwhile, student responses were mostly in the range of scores 3 and 4, with an overall percentage of approximately 95%, categorized as excellent. In addition, pretest and posttest data were collected to measure the effect of using the media on students' understanding.

7. Data Analysis and Operational Revision (Product 3)

After the main field trial, the authors analyzed the questionnaire results, test data, and interviews with teachers to identify the strengths and weaknesses of Product 2. Although the media was categorized as very good, several practical improvements were still needed, especially related to mobility and classroom use. To improve its practicality, the authors added a handle at the top of the media to make it easier to carry. A hinged support was also added so that the media could stand firmly during classroom use. In addition, the title *"My Eyes"* was embossed on the media to make it more visible and attractive. These revisions resulted in Product 3, which became a more operational version and was more ready to be used in daily learning activities.

8. Operational Trial and Statistical Testing

Product 3, as the final product, was implemented in learning activities using a pretest–posttest design. The participants were 54 students selected from a total of 80 fifth-grade students in the three development schools. The authors conducted a normality test using the *Lilliefors* test, and the results showed that the data were normally distributed. Therefore, the data were appropriate for further analysis using a t-test. The average pretest score was 10.83 and increased to 12.02 in the posttest, with a mean difference of 1.19. The paired t-test results showed that the calculated t-value was 12.399, which was higher than the critical t-value of 1.674 ($\alpha = 0.05$). This indicates that there was a significant difference between students' scores before and after using *My Eyes* media. These findings provide evidence that the media is effective in improving students' understanding.

9. Final Revision and Final Product Specification

Based on the results of the operational trial and data analysis, the authors finalized the product design with specifications ready for recommendation and use. The final product is a rectangular board with strong and attractive colors. It features illustrations of the parts of the eye, and the labels can be inserted using sturdy and durable sticks. The title *"My Eyes"* is embossed on the board to make it more visible. The media is also equipped with a handle at the top and a hinged support at the back, allowing it to stand firmly at the front of the classroom. The product is designed to be easy to use by both teachers and students, either during material explanation or during activities where students insert the names of the eye parts. Therefore, the final product meets the requirements of aesthetics, functionality, and durability.

10. Dissemination and Implementation

In the final stage, the authors concluded that *My Eyes* media is feasible, practical, and

effective for use in fifth-grade elementary school IPAS learning. This conclusion is based on expert validation results, teacher and student responses, and statistical test findings. The media has been proven to help students overcome difficulties in understanding the parts of the eye and their functions in a more concrete and engaging way. With an effectiveness increase of approximately 18.28% and very positive responses from several schools, the authors recommends that *My Eyes* media be disseminated to other elementary schools as an alternative concrete learning media, especially for teaching body organs, particularly the eye. Wider implementation of this media is expected to improve the quality of IPAS learning and can serve as a reference for the development of similar educational media in the future.

This discussion positions *My Eyes* media within learning theory and relevant previous studies, showing that the product is not only practically feasible but also theoretically and empirically supported. The material on the eye and its functions contains abstract concepts that are difficult for students in the concrete operational stage to understand if it is only delivered through lectures and two-dimensional images. *My Eyes* media, in the form of a three-dimensional (3D) model of eye anatomy, helps make these concepts more concrete(Tsui et al., 2022). This is in line with the theory of Jean Piaget, which states that elementary school students learn more effectively through real objects and hands-on activities. Previous research on the use of 3D eye anatomy media in elementary schools also indicates that three-dimensional visualization helps students better understand the shape, size, and relationships between the parts of the eye(Vatankhah et al., 2022).

Several studies have shown that the use of concrete objects is effective in increasing students' interest and learning outcomes in IPAS subject. The implementation of concrete objects and demonstrations in fourth-grade IPAS learning increased students' learning interest from 40% to 80% and improved the average score from 63 to 83.57. Another study on the use of concrete objects in IPAS also reported a significant positive effect on elementary school students' motivation and learning outcomes. These findings are consistent with the results of *My Eyes* media. Student responses were in the "good" to "very good" categories, and there was an increase in the average score from pretest to posttest. Although the effectiveness gain of approximately 18% can be categorized as moderate, it still shows a positive impact. This indicates that the concrete and tactile characteristics of *My Eyes* media work through similar mechanisms as other concrete learning media used in science education research.

Research on the development of other IPAS learning media, such as animal life cycle scrapbooks, interactive digestive system media, and miniature electrical energy models for fifth-grade IPAS, shows a consistent pattern. These products were developed using the Research and Development (R&D) approach, validated by experts, tested through limited and wider trials, and resulted in significant improvements in pretest–posttest scores, along with very positive responses from teachers and students. In this context, *My Eyes* media can be positioned as a concrete and visual 3D learning media specifically designed for eye anatomy(Krüger et al., 2022). It complements computer-based or animated media that focus mainly on digital visualization. One advantage of *My Eyes* media compared to digital media is the involvement of students' motor skills, such as attaching labels, disassembling, and reassembling the eye parts. These activities engage multiple senses at the same time, which can support deeper understanding of the learning material.

Relevant studies on the development of IPAS learning media generally use the Borg and

Gall R&D model or its modifications, with three main indicators: feasibility (expert validation), practicality (teacher and student responses), and effectiveness (pretest–posttest t-test results). The validation results of *My Eyes* media by media and material experts, which reached the good to very good categories, indicate that this media meets the feasibility criteria in terms of content and design. The teacher questionnaire results in three development schools, which were above 80%, and student responses that were mostly in the "good" to "very good" categories show that *My Eyes* media is practical to use. These findings are consistent with other studies on concrete object media in elementary IPAS learning. Furthermore, the paired t-test results on the pretest and posttest scores showed a significant difference. This finding is similar to several IPAS education studies that reported a calculated t-value of around 12 and a substantial increase in learning outcomes after the implementation of developed media.

CONCLUSION

The development of *My Eyes* learning media followed the ten steps of the Borg and Gall model in a systematic manner. The process began with research and initial information gathering to identify students' low understanding of the topic of the eye and its functions. This was followed by planning the objectives and specifications of the media. Next, the authors developed the initial product (Product 1), conducted limited trials with validation from media experts and material experts, and then revised the product into Product 2. After that, a main field trial was conducted in several schools. Further operational revisions were made, resulting in Product 3, which was more durable and practical. Product 3 was then tested through an operational trial accompanied by statistical analysis, including a normality test and a paired t-test. The results showed a significant improvement in students' learning outcomes. Finally, the authors concluded that the media is feasible and effective, and recommended the dissemination and wider use of *My Eyes* media in fifth-grade elementary school IPAS learning.

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