Implementation of Augmented Reality-Based Learning Media on The Material of Grouping Animals Based on Their Food Types for Class III Students

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Abstract: This study aims to test the results of the development of Augmented Reality-based learning media using the Assmblr Edu platform on the material of grouping animals based on their food types, namely herbivores, carnivores, and omnivores, for third-grade elementary school students. The background of this study is based on the low interest of students in learning science material due to the limited learning media that can provide an interesting and enjoyable learning experience. The development model used in this study is the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The subjects of this study consisted of 16 third-grade students of SDN Kedensari 1. The instruments used included validation by material experts and media experts, teacher response questionnaires, student response questionnaires, and student evaluation tests. The results of this validation indicate that the AR-based learning media developed is included in the category of very valid and feasible to use. In addition, this media also received positive responses from teachers and was proven to improve students' understanding of the material of grouping animals based on their food types.

Keywords: Augmented Reality, Types of Animal Food, Learning Media.

INTRODUCTION

Over time, technology has undergone significant developments in the world of education. Today, nearly all aspects of education utilize technology to simplify various tasks and processes, making them more efficient and effective. Technology has become a crucial supporting tool in education, facilitating teachers in delivering material to students to achieve desired learning objectives. The use of technology in the learning process is increasingly common, with teachers leveraging it to improve student learning outcomes (Maritsa et al., 2021). A quality learning process must include interactive, fun, and challenging elements. Providing students with encouragement and broader opportunities to develop their creativity and independence can be done by following their talents and interests (Ashari et al., 2022). Teachers play a crucial role in the learning process, as they are responsible for shaping the character and competencies of students. Teachers are expected to be innovative in active and creative learning media, as well as capable of instilling good character education in the learning process (Wulandari et al., 2020). Therefore, teacher creativity in managing the classroom plays a very important role in creating interesting and effective learning.

One technology widely developed to support learning is Augmented Reality (AR), which allows students to view three-dimensional objects in real time through digital devices. This technology connects the real world with virtual objects, creating a more contextual and engaging experience (Indahsari & Sumirat, nd). According to Hermawan and Hadi (2024) Augmented Reality (AR) has proven to be very helpful for students in understanding difficult and abstract material by presenting content in 3D and animated forms, so they can explore the material from various perspectives.

A quality learning process must include interactive, fun, and challenging elements. Providing students with encouragement and broader opportunities to develop their creativity and independence can be done by following their talents and interests (Ashari et al., 2022). Teachers play a crucial role in the learning process, as they are responsible for shaping the character and competencies of students. Teachers are expected to be innovative in active and creative learning media, as well as capable of instilling good character education in the learning process (Arsini et al., 2023). Therefore, teacher creativity in managing the classroom plays a very important role in creating interesting and effective learning.

One way to improve learning effectiveness is to develop and utilize learning media. Learning media are tools teachers use to communicate messages to students so that the material can be understood properly (Moto, 2019). In today's digital era, learning media is increasingly evolving to keep pace with technological advancements. Educational transformation in the Industry 4.0 era demands the use of digital technology to create more effective and innovative learning experiences. One technology that can be applied to learning is augmented reality (AR) (Kuncara & Pradja, 2025).

Augmented reality is the merging of two worlds: the virtual world and the real world. In other words, objects in the virtual world can be projected into the real world. AR allows users to view the real world with computer-generated virtual objects in real time.(Nuriana, nd)With AR technology, learning can be presented in a more engaging way. AR plays a crucial role in stimulating student interest in learning. Students can directly see three-dimensional objects and engage in deeper and more effective learning compared to one- or two-dimensional images (Setyawan et al., 2019).

Natural and Social Sciences (IPAS) is a compulsory subject for elementary school students. Through IPAS, students are guided to understand their surroundings (Hikmawati & Yonanda, 2022). However, science is often considered a challenging subject because it requires a lot of thinking skills, practice, and a deep understanding of scientific concepts, especially in the current independent curriculum (Gumilar, 2023). Therefore, the use of AR as a learning medium for science will be very interesting for students and can be better explained through AR technology.

Based on the results of an interview conducted on December 12, 2024, the resource person stated that so far, classroom learning has only used posters depicting animal classifications based on their diet. Although this media is quite helpful in providing simple visualizations to students, it has not been able to create a more interactive learning experience. Furthermore, to date, the use of AR-based learning media has not been implemented in the learning process. This obstacle is caused by limited existing facilities and a lack of training in utilizing this technology. In addition, the teacher revealed that the main challenge often faced is that not all students can understand the material well. The limitations of the media used are one of the factors that hinder students' understanding of the subject matter, so that the teaching and learning process feels less than optimal in achieving learning objectives.

According to the results of research conducted by Rahmawati et al., (2024) the validity test of the material and media has achieved a score of 87.5% ease. The use of AR technology in learning media is considered very effective based on teacher responses that reached a score of 95%. The response from students obtained was with a score of 92%, the results of the study indicate that AR-based learning media is very comfortable and suitable for use. There is a significant difference in student learning outcomes before, utilizing learning media with an average score of 53, then feeling the benefits after using learning media with the help of AR is very appropriate, so it can be used to improve the teaching and learning process and inspire students' enthusiasm and enthusiasm while learning. Based on the explanation above, the researcher is interested in conducting research on "Development of AR-Based Learning Media on Animal Grouping Material Based on 2 Types of Food for Grade III Students of SDN Kedensari 1". This research was conducted because there are still many limitations in the use of interactive learning media at SDN Kedensari 1, especially in animal grouping material. With this learning media, teachers are expected to have more interesting and effective alternatives in delivering the material, so that it can improve students' understanding more deeply. In addition, this study aims as follows: 1) to describe the process of developing AR-based learning media; 2) to describe the validity of AR-based learning media on the material of grouping animals based on their food types; 3) to describe the practicality of learning media in grade III of Elementary School; 4) to explain the effectiveness of AR learning media.

METHODS

Types of research

The model used in this study is the ADDIE model. The ADDIE model consists of five steps, namely: analysis, design, development, implementation, and evaluation. The product developed in this study is an augmented reality-based learning media for the science subject of animal grouping based on their food types for class III of SDN Kedensari 1. According to Alam Huda et al., (2024) Research and development methods are research methods that aim to develop and test products, which will then be applied in the world of education. Meanwhile, according to Okpatrioka, Research and development is a method and series of steps aimed at creating new products or developing and refining existing ones. The goal of this process is to test the effectiveness of the product so that

the results can be accounted for. From this explanation, researchers can conclude that research and development is a research method aimed at creating specific products.

Research Object

The object of this research is augmented reality-based learning media in the subject of science with the material of grouping animals based on their food types. This research was conducted in one class, namely class III at SDN Kedensari 1, with a total of 16 students. Research Procedure The research model used by the researcher is the ADDIE development model.

Research Procedures

The research model used by the researcher is the ADDIE development model.

The ADDIE model uses five stages of development as follows:
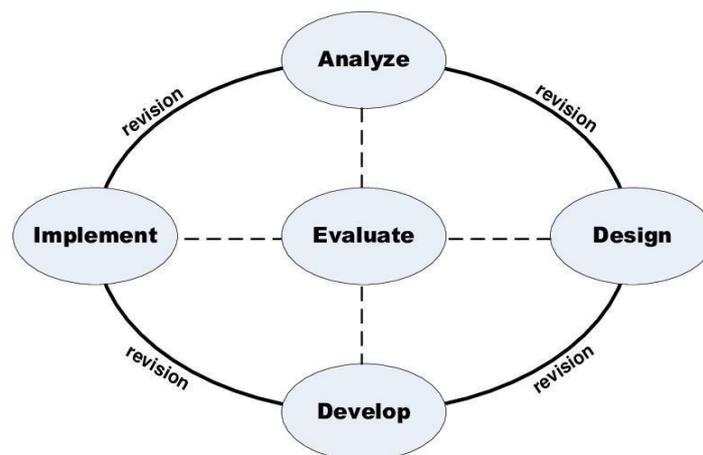
Figure 1. ADDIE model development stages

1. Analyze

The analysis stage aims to identify possible causes of gaps in learning performance. In this stage, teachers need to determine instruction that can address these gaps, determine the level of effort required to address these gaps, and offer strategies to support learning success (Nainiti et al., nd). At this stage, the researcher analyzed the obstacles that existed in the science lesson on classifying animals based on their food. The main problem lies in the limited use of learning media, namely posters. The methods used also tend to be monotonous, such as lectures, which has an impact on students' lack of enthusiasm in participating in the lesson.

2. Design

The design step aims to verify learning readiness and determine appropriate evaluation methods. At this stage, teachers must be able to design a series of specific steps to address gaps in the implementation of learning, especially in addressing the lack of knowledge and skills of Branch students. Based on the analysis of obstacles in science learning with the material of grouping animals based on their types of food, researchers designed augmented reality-based learning media as a solution to improve the quality of learning and motivate students.

3. Development

In the context of developing science and natural sciences (IPAS) subject matter, specifically grouping animals based on their diet, teachers can utilize augmented reality as an innovative learning resource. This technology aims to improve student understanding and learning outcomes, enabling more effective learning objectives. Teachers can develop material on grouping animals based on their diet using augmented reality. This technology is expected to improve student learning outcomes, enabling more effective learning objectives.

4. Implementation

The implementation phase aims to prepare a conducive learning environment and actively engage students in the learning process. Media development activities and evaluation of their implementation are part of the final implementation phase. At this stage, the learning process is also directed to support the transition to evaluation, which is a crucial part of the ADDIE Branch learning strategy.

5. Evaluation

This stage is the final stage in the ADDIE development model, where an evaluation is conducted to assess product feasibility and collect data regarding the development process. This process involves summarizing and analyzing the results of the questionnaires distributed to experts and students. The results of this stage serve as the basis for concluding the effectiveness and quality of the developed media.(Hidayat et al., nd).

Data collection technique

1. Interview

   An interview is essentially a conversation between two or more parties, involving a researcher and a source. In this technique, the researcher and source interact directly to obtain information verbally, with the goal of collecting data that can explain the research problem (Yuhana & Aminy, 2019). In this study, the interview technique was used to collect data from teachers regarding the development of augmented reality media.

2. Questionnaire

   In this study, a questionnaire was used to measure the validity of the developed media. The questionnaire used in this study was a validation questionnaire. The validation questionnaire was given to material experts and learning media experts and was designed to assess the extent to which the media was appropriate, accurate, and effective in supporting the learning process. The experts provided input through the validation questionnaire. The input and suggestions obtained from this validation result are very valuable as considerations for improving and perfecting the media, so that it can truly meet learning needs and provide maximum benefits for students in accordance with expected academic standards (Puspitasari & Febrinita, 2021). The results of the expert evaluation will serve as a guideline for improving and perfecting the learning media, with the hope of producing a more effective product that meets learning needs.

3. Test

   After the teaching materials were implemented, researchers conducted an evaluation to determine the extent to which the augmented reality-based learning media contributed to helping students understand the material. This evaluation was based on indicators that aligned with the content presented through the learning media. The information obtained from this evaluation was used to assess the extent to which the teaching materials were able to effectively support the learning process (Idrus, n.d.).

RESULTS

Development Stage

1. Description of Analysis Stage

The analysis phase was conducted to identify learning barriers occurring in the classroom and students' needs for more appropriate learning media. By understanding the obstacles faced, both in terms of materials, methods, and media used, researchers were able to design appropriate and effective solutions. This analysis also helped in adapting learning media to be more interesting, easier to understand, and able to increase student motivation and engagement in the learning process. This analysis served as the initial foundation in the process of developing technology-based learning media that aimed to increase the effectiveness and engagement of students in learning. The analysis data were obtained through interviews with grade III teachers at SDN Kedensari 1. The results of this analysis phase are as follows:

a. Learning Obstacles: The teacher reported that during the science lesson on classifying animals based on their diet, several obstacles were encountered that disrupted the learning process. The learning media used was limited, consisting only of posters. Furthermore, the dominant lecture method resulted in a lack of variety and made students passive and easily lose focus.

b. Student Needs for Learning Media: Based on interviews, teachers also explained that students require more engaging and easy-to-understand learning media. These media are expected to present material with supporting visuals, thereby helping students better understand the content. Technology-based media, such as AR, are considered to have the potential to meet students' learning media needs.

2. Description of design stage

At this stage, researchers began designing AR-based learning media aimed at helping third-grade students at SDN Kedensari 1 understand the material on classifying animals based on their diet: herbivores, carnivores, and omnivores. This media allows students to view three-dimensional animal models, making learning more engaging and easier to understand.

The design of this learning media not only focuses on visual appearance but also adapts the content to the curriculum and students' learning needs. The steps taken at this stage are as follows:

a.   Collection of References and Review of Materials

In this step, the learning media design process begins by gathering various relevant sources, such as books, educational articles, and learning materials aligned with the Merdeka curriculum, specifically on the topic of classifying animals based on their diet. The selected materials are also tailored to be easy to understand and can be presented in an engaging manner through AR.

b.   Initial Design

In this study, researchers designed AR-based learning media that aims to facilitate students in understanding the material regarding the grouping of animals based on their type of food, namely herbivores, carnivores, and omnivores. The design process began with compiling the initial design of the media, in which researchers compiled animal models that correspond to the category of each type of food. These models were developed using the assmblr EDU application and arranged in the form of attractive learning media. To increase student engagement, this media is also equipped with a quiz feature related to the material being studied. The design of the learning media is also adjusted to the needs of students so that learning feels fun and easier to understand. With a realistic visual display, it is hoped that students will be more enthusiastic in participating in learning and be able to understand the concept well.

3.   Development Stage Description

In this development stage, researchers begin designing and developing digital learning media to be used in the learning process. This stage aims to produce learning media that is not only informative but also enjoyable for students.

a.   Preparation of learning media

Figure 2. Initial Display of Learning Media

Figure 3. Main Menu View

Figure 4. User Guide Display

Figure 5. Herbivore Category Exploration View

Figure 6. Carnivore Exploration View

Figure 7. Omnivore Exploration View

Figure 8. Quiz View

b.   Description of the results of the validation of the suitability of learning media

This AR-based learning media was assessed using a questionnaire containing several aspects validated by subject matter and media experts. This validation process aims to ensure that the developed learning meets the standards for content and presentation in the learning process.

1)   Validation results of material experts In the validation stage, the researcher presented the AR-based learning media that had been developed to the material expert validator, accompanied by an assessment sheet that had to be filled out. The validator then reviewed the entire content of the media and provided an assessment based on a number of aspects that had been prepared by the researcher, including the suitability of the material to the curriculum. In this study, the person who acted as the material expert validator was Mrs. Hikmah Luqiyah Kartikasari, S.Pd., M.Pd. Based on the assessment results given by the validator, the final score was 41 out of a maximum score of 45. The validity level was calculated using the formula:

$$Presentase\ kevalidan(p) = \frac{41}{45} \times 100\%$$

Thus, the developed learning media achieved a validity level of 91.11%, which falls into the "very valid" category. This means the media is considered very valid for use in the learning process, although some improvements are still needed.

2)   Media expert validation results

In the media validation stage, researchers presented the AR-based learning media they had developed to expert media validators, along with a prepared assessment sheet. The validators then reviewed the media's appearance, functionality, and overall elements and provided an assessment based on predetermined aspects.

In this study, the media expert validator was Mr. Muhammad Setyo Wardono, S.Pd., M.Pd. Based on the assessment results given by the validator, the final score was 33 out of a maximum score of 40. The validity level was calculated using the formula:

$$Presentase\ kevalidan(p) = \frac{33}{40} \times 100\%$$

The validation results reached 82.5%, which falls into the "very valid" category. Thus, the AR-based learning media is considered very valid and suitable for use as a learning aid.

4.   Implementation Stage Description

The trial was conducted with 16 third-grade students at SDN Kedensari 1. At this stage, the researcher acted directly as a teacher, delivering material on classifying animals based on their diets—herbivores, carnivores, and omnivores—using AR-based media. This media allows students to view 3D visualizations of animals through the device, making the learning process more engaging and enjoyable.

The purpose of this implementation is to determine the effectiveness of the media in supporting student understanding of the material and to determine student responses to the use of technology in learning. The following are responses from classroom teachers and students after using learning media in the learning process.

a.   Teacher response questionnaire results

This AR-based learning media was not only tested directly with third-grade students, but was also shown to class teachers to obtain feedback regarding practicality, ease of use, and suitability of the media to classroom learning needs. Mrs. Sri Nuryani, S.Pd., a third-grade teacher at SDN Kedensari 1, also reviewed and provided her opinion on the media that had been developed. The questionnaire results showed that the AR-based learning media obtained a final score of 41 out of a maximum score of 45. The level of practicality was calculated using the formula:

$$Presentase\ kepraktisan(p) = \frac{41}{45} \times 100\%$$

The teacher questionnaire's response rate reached 91.11%, falling into the "very practical" category. This demonstrates that the AR media developed is very easy to use in learning, supports visual and interactive delivery, and helps teachers achieve learning objectives, particularly regarding the topic of grouping animals based on their diet.

b.   Student questionnaire results

In this trial, students acted as the main subjects to assess the practicality of AR-based learning media in the learning process. This media was specifically designed to facilitate students' understanding of the material on grouping animals based on their type of food, namely herbivores, carnivores, and omnivores. Researchers conducted the trial on June 23, 2025, at SDN Kedensari 1, involving 16 third-grade students as part of this study. After analyzing the questionnaires filled out by students, it was found that the AR-based learning media received a score of 411 out of a maximum total score of 480.

$$Presentase\ kepraktisan(p) = \frac{411}{480} \times 100\%$$

These results indicate that 85.62% of students responded positively. Therefore, this AR-based learning medium is considered "practical" for use in learning because it can better support student understanding.

5.   Evaluation Stage Description

a.   Evaluation test results

The results of this evaluation test provide students with an understanding of the material on grouping animals based on their diet (herbivores, carnivores, omnivores) that they have learned through AR-based learning media. The purpose of this evaluation is to determine the extent to which students can understand and identify animal types based on their diet and relate this to everyday life. The information obtained from this evaluation is crucial for assessing the effectiveness of the learning media used and designing more enjoyable learning strategies.

From the evaluation results, it was found that the average class score obtained by students was 83.6 and as many as 81.2% of students were declared to have achieved a score $\geq$ Minimum Completion Criteria (KKM). The level of effectiveness of learning media was calculated using the following formula:

$$Presentase\ keffectiveness\ (p) = \frac{13}{16} \times 100\%$$

With a completion percentage of 81.25% and a class average value of 83.6, the AR-based learning media developed is included in the effective category, in accordance with the effectiveness criteria established in this study.

However, during implementation, some students still lacked focus during the learning process. However, this does not entirely reflect a lack of student engagement, as most students remained attentive throughout the learning process. Therefore, the AR-based

learning media developed can be considered suitable for use in learning, both in terms of practicality and effectiveness.

DISCUSSION

The application of Augmented Reality (AR)-based learning media to classify animals based on their diet has been shown to positively contribute to the achievement of science learning objectives in elementary schools. These findings demonstrate that AR can bridge the cognitive developmental characteristics of third-grade students, who are still at the concrete operational stage, by presenting realistic and contextual visualizations of learning objects. These results reinforce the view that the appropriate use of educational technology can improve the quality of learning, particularly in conveying abstract science concepts (Maritsa et al., 2021; Moto, 2019).

Pedagogically, the effectiveness of AR media in this study lies not only in its visual aspects, but also in its ability to create interactive and meaningful learning experiences. AR media allows students to actively observe, explore, and construct knowledge, thereby encouraging cognitive engagement and higher learning motivation. This finding aligns with previous research that states that the use of AR in science and science learning can improve conceptual understanding and learning motivation in elementary school students (Setyawan et al., 2019; Edtrikawati & Anistyasari, 2017; Nadyarta et al., 2025).

The results of this study also strengthen empirical evidence that AR-based learning media is effective in science learning at the elementary level, as reported in various previous studies (Ashari et al., 2022; Hermawan & Hadi, 2024; Alfarizi et al., 2024). The consistency of these findings indicates that AR has great potential as an innovative learning medium relevant to the demands of 21st-century learning and the implementation of the Independent Curriculum, which emphasizes learner-centered learning and authentic learning experiences (Gumilar, 2023).

However, this study is limited by the number of subjects and the duration of media implementation, so generalization of the results should be done cautiously. Furthermore, the development of AR media can still be improved by adding audio features, narration, or interactive evaluations to accommodate diverse student learning styles. Therefore, further research is recommended to implement AR media over a longer period and on a broader range of science and science material to obtain a more comprehensive picture of its effectiveness.

CONCLUSION

The findings show that the developed AR-based interactive learning media has been declared valid based on assessments from subject matter and media experts. Validation indicates that, in terms of content and appearance, this media is suitable for use in learning. The validation score from subject matter experts reached 91.11% (very valid), while from media experts it was 82.5% (very valid).

Furthermore, this media was also deemed practical by teachers and students. The questionnaire results showed a positive response from teachers (91.11%) (very practical) and from students (85.62%) (practical). This indicates that this learning media is easy to use, engaging, and helpful in the classroom learning process.

In terms of its contribution to student understanding, the use of this media in the learning process demonstrated an increase in student understanding, with a completion rate of 75%. These results demonstrate that AR media is not only visually appealing but also has a positive impact on understanding the concepts being studied. Therefore, this learning medium is deemed valid, practical, and quite effective, although it still has room for further improvement, particularly in terms of material and evaluation.

Based on the research findings, several recommendations are offered to various parties. Students are encouraged to utilize AR-based learning media as a fun and interactive learning tool. The 3D visualizations displayed can help students more easily understand the material on classifying animals based on their diet. However, students are also advised to continue expanding their knowledge through other learning resources.

For teachers, this media can be an alternative support for science lessons, particularly for classifying animals based on their diet. Teachers can use this media to

increase student interest and combine it with other learning methods to make the learning process more varied and effective.

For future researchers, it is recommended to develop AR learning media with more comprehensive features, such as adding voice narration and learning videos. Furthermore, further studies on the media's effectiveness over a longer period of time are needed to obtain more comprehensive results.

REFERENCES

Alam Huda, T., Saputro, B. A., Purnamasari, I., & Dasar, M. P. (2024). Pengembangan multimedia interaktif berbantuan GeoGebra untuk menumbuhkan literasi numerasi kelas IV sekolah dasar. *Media Pendidikan Matematika, 18*(2), 165–171. https://doi.org/10.26877/mpp.v18i2.20798

Alfarizi, M., Nasihudin, N., & Mahmud, M. R. (2024). Pengembangan media pembelajaran augmented reality (AR) untuk meningkatkan hasil belajar siswa pada pelajaran IPA. *Jurnal Riset dan Inovasi Pembelajaran, 4*(3), 1989–2000. https://doi.org/10.51574/jrip.v4i3.2269

Arsini, Y., Yoana, L., & Prastami, Y. (2023). Peranan guru sebagai model dalam pembentukan karakter peserta didik. *MUDABBIR Journal Research and Education Studies, 3*(2), 27–35. https://doi.org/10.56832/mudabbir.v3i2.368

Ashari, S. A., A, H., & Mappalotteng, A. M. (2022). Pengembangan media pembelajaran movie learning berbasis augmented reality. *Jambura Journal of Informatics, 4*(2), 82–93. https://doi.org/10.37905/jji.v4i2.16448

Edtrikawati, M., & Anistyasari, Y. (2017). Pengembangan aplikasi media pembelajaran berbasis augmented reality untuk mengetahui faktor motivasi belajar siswa. *Jurnal IT-EDU, 2*(1), 97–101.

Gumilar, E. B. (2023). Problematika pembelajaran IPA pada Kurikulum Merdeka di sekolah dasar/madrasah ibtidaiyah. *Jurnal Pedagogy, 16*(1), 129–145. https://doi.org/10.63889/pedagogy.v16i1.159

Hermawan, A., & Hadi, S. (2024). Realitas pengaruh penggunaan teknologi augmented reality dalam pembelajaran terhadap pemahaman konsep siswa. *Jurnal Simki Pedagogia, 7*(1), 328–340.

Hidayat, F., et al. (n.d.). Model ADDIE (analysis, design, development, implementation, and evaluation) dalam pembelajaran pendidikan agama Islam.

Hikmawati, R., & Yonanda, D. A. (2022). Keterkaitan motivasi belajar siswa dan hasil belajar IPA di sekolah dasar. *Mirabilis Journal of Biology Education, 1*(2).

Idrus, L. (n.d.). *Evaluasi dalam proses pembelajaran*.

Indahsari, L., & Sumirat, S. (n.d.). Implementasi teknologi augmented reality dalam pembelajaran interaktif. *Cognoscere*. Diakses dari https://journals.ldpb.org/index.php/cognoscere

Kuncara, F. N., & Pradja, B. P. (2025). Analysis of the use of augmented reality in education. *Journal, 10*(2), 299–313.

Maritsa, A., Salsabila, U. H., Wafiq, M., Anindya, P. R., & Ma'shum, M. A. (2021). Pengaruh teknologi dalam dunia pendidikan. *Al-Mutharahah: Jurnal Penelitian dan Kajian Sosial Keagamaan, 18*(2), 91–100. https://doi.org/10.46781/al-mutharahah.v18i2.303

Moto, M. M. (2019). Pengaruh penggunaan media pembelajaran dalam dunia pendidikan. *Indonesian Journal of Primary Education, 3*(1), 20–28. https://doi.org/10.17509/ijpe.v3i1.16060

Nadyarta, S. A., Fakhriyah, F., & Purbasari, I. (2025). SOCA: Inovasi media pembelajaran berbasis augmented reality untuk meningkatkan motivasi belajar IPAS siswa sekolah dasar. *Jurnal Riset dan Inovasi Pembelajaran, 5*(2), 727–741. https://doi.org/10.51574/jrip.v5i2.3700

Nainiti, N. P. P. E., et al. (n.d.). *Manajemen mutu pendidikan*.

Nuriana, N. (n.d.). *Pengenalan hewan menggunakan augmented reality sebagai media pembelajaran*.

Okpatrioka. (n.d.). *STKIP Arrahmaniyah*.

Putra, I. W. R. A., Widiana, I. W., & Jayanta, I. N. L. (2025). Pengembangan media pembelajaran Si Ceria berbasis AR untuk meningkatkan pemahaman konsep sains dan learning engagement. *Journal of Education Technology, 9*(1), 181–189. https://doi.org/10.23887/jet.v9i1.94929

Puspitasari, W. D., & Febrinita, F. (2021). Pengujian validasi isi (content validity) angket persepsi mahasiswa terhadap pembelajaran daring matakuliah matematika komputasi. *Focus ACTion of Research Mathematic, 4*(1). https://doi.org/10.30762/factor-m.v4i1.3254

Setyawan, B., Rufii, N. F., & Fatirul, A. N. (2019). Augmented reality dalam pembelajaran IPA bagi siswa SD. *Kwangsan: Jurnal Teknologi Pendidikan, 7*(1), 78–90. https://doi.org/10.31800/jtp.kw.v7n1.p78--90

Sylvia, F., Ramdhan, B., & Windyariani, S. (2021). Efektivitas augmented reality terhadap higher order thinking skills siswa pada pembelajaran biologi. *BIODIK: Jurnal Ilmiah Pendidikan Biologi, 7*(2), 131–142. https://doi.org/10.22437/bio.v7i2.13034

Wulandari, R., Dewi, N. A., & Lamopia, I. W. G. (2020). Representasi peran guru dalam pembentukan pendidikan karakter bagi siswa sekolah dasar di SDN 3 Tonja Denpasar. *Madaniya, 1*(1), 9.

Yuhana, A. N., & Aminy, F. A. (2019). Optimalisasi peran guru pendidikan agama Islam sebagai konselor dalam mengatasi masalah belajar siswa. *Jurnal Penelitian Pendidikan Islam, 7*(1), 79. https://doi.org/10.36667/jppi.v7i1.357