

Development of Canva-Based Science Infographic Learning Media to Improve Students' Learning Outcomes

Sevi Ristanti^{1*}, Barokah Isdaryanti¹

¹Faculty of Education and Psychology, Universitas Negeri Semarang, Semarang, Indonesia.

Received: August 23, 2024

Revised: September 18, 2024

Accepted: October 25, 2024

Published: October 31, 2024

Corresponding Author:

Sevi Ristanti

seviristanti27@students.unnes.ac.id

DOI: [10.29303/jppipa.v10i10.9506](https://doi.org/10.29303/jppipa.v10i10.9506)

© 2024 The Authors. This open access article is distributed under a (CC-BY License)



Abstract: The aim of this research is to develop, test the feasibility, and effectiveness of Canva-based infographic learning media. This type of research and development (R&D) development research with the ADDIE development model, namely analysis, design, development, implementation, and evaluation). The research subjects were fourth grade students totaling 25 students, data collection techniques with observation, interviews, questionnaires, and documentation data. The results of media expert validation show a percentage value of 88.3% very feasible category, material experts with a percentage value of 86.66% very feasible category. Based on the pretest-posttest results, it is known that Canva-based infographic media is effective in improving student learning outcomes, which is indicated by an increase in the average pretest score from 52 to 80 on the posttest, with an N-Gain test result of 0.58 in the moderate category. Based on the response questionnaire distributed, a very positive response was obtained from teachers and students. From these results, it can be concluded that Canva-based infographic learning media is effective in improving student learning outcomes and is feasible and practical to use in IPAS learning on respiratory system material in grade V SD Negeri Tambakaji 05.

Keywords: Canva; Learning media; Learning outcomes; Science infographic

Introduction

Education is an important element and a primary need for human life (Haleem et al., 2022; Li et al., 2023; Miranda et al., 2021). Basically, education contains changes in knowledge, values, and skills both within and outside education that last throughout life (Alenezi et al., 2023; Janssens et al., 2022; Shukshina et al., 2021). One of the reasons of a developed nation is because the nation has educated, intelligent, and dignified human resources (Zakiyah, 2019).

Based on the Law on the National Education System No. 20 of 2003, education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble morals, and skills needed by themselves, society, nation and state (Neves & Giorgi, 2022; Nur & Fatonah, 2022; Simamora & Songgirin,

2023). Referring to this law, developing students' potential is the goal of national education. This student development is carried out through educational institutions, both formal educational institutions and non-formal educational institutions (Akib et al., 2020; Saputra, 2018).

In developing students' potential, an interesting and enjoyable learning atmosphere is needed in the classroom (Bonastra & Jové, 2022; Elhawwa, 2022; Michels et al., 2020). It is the task of a teacher in the teaching and learning process in the classroom to guide students so that they feel comfortable and happy in class, making them are able to understand the learning material, and the learning objectives can be achieved (Alles et al., 2019; Shen et al., 2020; Yusuf et al., 2023).

Learning achievement or learning outcomes achieved by an individual are the result of interactions between various factors that influence it both from within the individual (internal factors) and from outside

How to Cite:

Ristanti, S., & Isdaryanti, B. (2024). Development of Canva-Based Science Infographic Learning Media to Improve Students' Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, 10(10), 7984–7992. <https://doi.org/10.29303/jppipa.v10i10.9506>

the individual (external factors) (Gusnarib & Rosnawati, 2021). Student learning outcomes are commonly influenced by internal and external factors (Astiti et al., 2021). Internal factors are factors that come from within students, such as intelligence, attitudes, interests, talents, habits, and motivation. Meanwhile, external factors are factors that come from outside students, including family, community, and school. Internal factors that influence student learning outcomes are learning styles and learning media (Balakrishnan & Gan, 2016; Laswadi et al., 2022; Nurmalisa et al., 2023).

Nowadays, the development of technology and information is growing very rapidly, encouraging various areas of human life to adapt quickly. One of them is in the field of education. It is expected that people can take advantage of these technological developments to produce learning that is innovative, effective, efficient, and right on target. An important element of education in learning that can be developed by utilizing technology is learning media (Suendarti & Virgana, 2022).

Learning media is utilized as a tool in the learning process, particularly in presenting interesting material by making the learning situation more active so that students can easily understand the material and have an impact on improving the quality of learning in order to achieve learning goals effectively and efficiently (Fajari et al., 2020; Shamsuddin & Kaur, 2020). Learning media can facilitate the process of learning activities, which aim to clarify the delivery of the meaning of learning so that learning objectives can be conveyed more perfectly (Fajari et al., 2020). By utilizing this learning media, it can also be used as a tool or connecting medium to convey messages or information from educators to students in order to understand the learning material. Learning media is able to improve the quality of learning for educators as a means to help deliver learning material that is innovative, creative, comprehensive, attracts enthusiastic students, and creates enjoyable learning situations (Afolabi, 2021).

Based on the results of observations and unstructured interviews with the principal and V grades homeroom teacher, the facilities at this school are quite complete and support the teaching and learning process. This is evidenced by the availability of LCDs, projectors, laptops, and WiFi networks. Even though the facilities are quite complete, some teachers still use lecture and learning methods and do not utilize interactive learning media. The learning media used are only pictures and videos from YouTube. The material taught is limited to textbooks, worksheets, and some material from the internet, where these sources should be used as references to develop wider learning material. In the material about the human respiratory system, the teacher utilizes science learning media in the form of

textbooks, pictures of the human respiratory system, and learning videos. The use of less interesting media makes students tend to be passive and get bored quickly. The lack of innovation in the development of learning media and the tendency to use the lecture method in conveying information is also one of the problems of students not understanding science and science learning so that learning objectives are not achieved well and the learning outcomes obtained by students are low (Dewi & Setyasto, 2024; Rosyid & Setyasto, 2024).

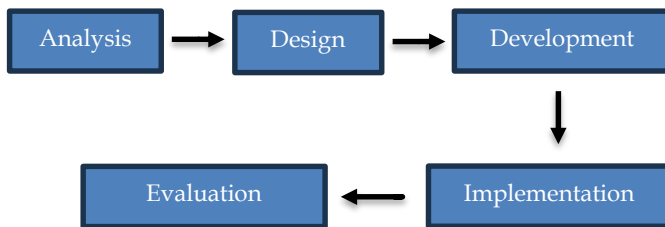
As an educator, the teacher has an important role in the success of students and has the ability to design creative and innovative learning that can attract students' attention so that they get learning outcomes in accordance with learning objectives. In this digital era, skills in utilizing technology can be used as additional competencies (Purnasari & Sadewo, 2021). In this situation, teachers are required to utilize technology to develop interesting, creative, and innovative learning media. One way that can be done is by implementing Canva-based infographic learning media to support the learning process, so that it can be applied in learning process. Infographic learning media is a part of the use of sophisticated technology in the world of education, which is implemented in teaching and learning activities by utilizing the Canva application via the internet network. This also provides new experiences in learning for students so that the learning process can be more varied, interactive, and innovative, which can improve student achievement (Rahman et al., 2020). This infographic learning media is easy to access and fast without reducing the meaning and learning objectives to be conveyed.

The development of infographic learning media has been carried out developing Android-based infographics for Social studies subjects. The results of the development carried out on an average of trials on students obtained results of 94.59% in the very good category (Kurniawan et al., 2022; Mawardani et al., 2022; Nurfadhilah et al., 2023). Firdaus et al. (2021) also developed an Android-based infographic application media in History lessons on Indonesian revolution material in class XI IPS to help students understand about abstract historical material to become concrete due to the illustrations that support the material. Moreover, the media development carried out by Dewi et al. (2021) by developing Instagram-based infographic learning media, the results motivate students' learning because it makes learning activities more interesting, easy to understand, and not boring.

Based on the description above, the aim of this research is to determine the development of Canva-based infographic learning media to improve student learning outcomes.

Method

The approach used in this research is a quantitative and qualitative approach or Research and development (R&D) (Sugiyono, 2019, 2020) with the ADDIE development model. The ADDIE development model is used for development research, which consists of 5 stages, namely analysis, design, development, implementation and evaluation.



Figural 1. ADDIE Model

The research conducted in this study developed Canva-based infographics on IPAS learning content to improve the learning outcomes of fifth grade students of SD Negeri Tambakaji 05. The analysis stage is the first stage carried out by researchers by conducting learning analysis, media analysis, and material analysis through interviews, observations, and questionnaires of the needs of teachers and students so that problems will be found and solutions to overcome problems. The second stage is design, which is designing the product design framework that will be developed. The next stage is development, at this stage the product will be validated by experts to assess the feasibility of the product. The implementation stage will be carried out a small-scale trial test totaling 6 students using purposive sampling technique based on high, medium, and low abilities. Students will be given pretest questions to determine the initial ability of students before learning to use learning media to determine the initial ability of students. After doing the pretest, students will learn using Canva-based infographic learning media. Posttest questions were distributed after the learning activities were completed. After working on the posttest questions, students and teachers fill out a response questionnaire to the media that has been used during learning. Based on the results of the teacher and student response questionnaires used as material for the teacher and student response questionnaires used as material for improvement used as material for improving the media to be used in large-scale trials. implementation of large-scale trials on 19 grade V students. The implementation of the large-scale trial begins with distributing pretest questions about pretest questions followed by learning activities using canva-based infographic learning media. The evaluation

stage is the last stage to improve the media based on suggestions and input from experts.

Result and Discussion

This research was developed through a Canva-based Infographic Learning Media product for science learning content on the Human Respiratory System. It was carried out at SD Negeri Tambakaji 05, Semarang City. The recapitulation of media suitability assessments by media experts can be seen as follows.

Table 1. Result of media suitability assessments by media experts

Aspects	Indicators	Score
Quality aspects of content and objectives	Accuracy	4
	Importance	4
	Interest/ Attention	3
	Appropriateness to the students' situation	3
Instructional aspects	Provide assistance for learning	4
	Motivation quality	3
	Instructional flexibility	4
	Correlation with other learning programs	3
Technical aspects	Able to provide impact on students	3
	Able to provide impact on teachers	3
Total Score	Readability	4
	User-friendly	4
	Quality of display or impression	3
	Quality of program management	4
	Quality of documentation	4
Total Score		53

Source: Arsyad (2020)

Based on the table above, it is known that the results of the media expert's assessment of the Canva-based infographic learning media developed by researchers are very suitable for use in learning. Media experts show a score of 53, with a percentage of 88.3%. According to the media eligibility criteria table, these results fall into the very feasible criteria and can be tested in the field without revision.

The implementation of small group trials was started with students working on pretest questions. These were done before learning was carried out using Canva-based infographic learning media. The teacher demonstrated the use of Canva-based infographic learning media during the learning process and it was followed by students. Below are the results of studying the content of science lessons on the human respiratory system in small-scale trials.

Table 2. Results of studying the content of science lessons on the human respiratory system in small-scale trials

Remark	Pretest	Posttest
Total of students	6	6
Average	59.16	80.83
Learning objective completion criteria (KKTP)	65	65
Highest score	85	95
Lowest score	45	70
Number of students completed	2	6
Number of students not completed	4	0
Average completion	33.33%	100%
Average improvement		66.67%

In order to find out students' responses to Canva-based infographic learning media, the researchers distributed questionnaires for students. Student response questionnaires were given to 6 students who participated in small group trials.

Student learning outcomes in large group product trials involving 19 fifth-grade students at SD Negeri Tambakaji 05, Semarang City are as follows.

Table 3. Results of studying the content of science lessons on the human respiratory system in large group

Remark	Pretest	Posttest
Total of students	19	19
Average	52.10	80
Learning objective completion criteria (KKTP)	65	65
Highest score	75	95
Lowest score	30	65
Number of students completed	5	19
Number of students not completed	14	0
Average completion	26.31%	100%
Average improvement		73.69%

In this study, the pretest and posttest normality tests used Microsoft Excel 2019 software. The results of the pretest and posttest normality tests in small group trials are presented in the following table.

Table 4. Result of the pretest and posttest normality tests in small group trials

Action	Lo	Lt	(α)	n	Criteria
Pretest	0.18	0.31	0.05	6	Ho accepted = normal
Posttest	0.20	0.31	0.05	6	Ho accepted = normal

Based on the table above, the largest absolute value (Lo) is taken by 0.18 in the pretest and 0.20 in the

posttest. By realizing that the L critical value for the sample (n) = 6 and the significance level (α) of 0.05 is 0.31. it can be concluded that the pretest value of Lo (0.18) < Lt (0.31) and the posttest value of Lo (0.20) < Lt (0.31). This means that the null hypothesis is accepted, or in other words the data is normally distributed. Then, the next calculation used parametric statistical calculations.

The results of the pretest and posttest normality tests in large group trials are presented in the following table.

Table 5. Result of the pretest and posttest normality tests in large group

Action	Lo	Lt	(α)	n	Criteria
Pretest	0.12	0.19	0.05	19	Ho accepted = normal
Posttest	0.13	0.19	0.05	19	Ho accepted = normal

Based on the table above, the largest absolute value (Lo) was taken of 0.127 in the pretest and 0.131 in the posttest. By realizing that the critical value L for the sample (n) = 19 and the significance level (α) of 0.05 is 0.195. It can be concluded that the pretest value of Lo (0.127) < Lt (0.195) and the posttest value of Lo (0.131) < Lt (0.195). This means that the null hypothesis is accepted or in other words the data is normally distributed. then the next calculation uses parametric statistical calculations.

After the pretest and posttest were declared to be normally distributed in the normality test. The researchers then tested the difference in pretest and posttest averages (t test) using parametric statistical techniques with the t-test formula. The following test results for the difference in average pretest and posttest scores are presented in the following table.

Table 6. Result of the pretest and posttest t test in small group trials

Data	(α)	Sig _{count}	DK	t _{table}	t _{count}	Remark
Pretest	5%	0.00721	8	2.30	3.55	Ha accepted
Posttest						

Based on the table above, the results of the pretest and posttest obtained by t-count is 3.55 and the t-table obtained from the dk calculation is then confirmed in the t-distribution value table. which is 2.30. The t-count is greater than t-table. then Ha is accepted. Thus. there is an influence in the use of Canva-based infographic learning media on student learning outcomes in the human respiratory system material for fifth-grade student elementary school because there is a difference in the average pretest and posttest scores.

The following test results for the difference in average pretest and posttest scores are presented in the following table.

Table 7. Result of the pretest and posttest t test in large group

Data	(α)	Sig _{count}	DK	t _{table}	t _{count}	Remark
Pretest	5%	4.58E-09	34	2.03	7.64	Ha accepted
Posttest						

Based on the table above, the results of the pretest and posttest obtained by t-count is 7.64 and the t-table obtained from the dk calculation is then confirmed in the t-distribution value table of 2.03. The t-count is greater than t-table, then Ha is accepted. Thus, there is an influence in the use of Canva-based infographic learning media on student learning outcomes in the human respiratory system material for fifth-grade students of elementary school because there is a difference in the average pretest and posttest scores.

The average increase in learning outcomes after using Canva-based infographic learning media can be calculated using the N-gain test. The test results for increasing the average value before learning and after learning can be presented in the following table.

Table 8. Result of the pretest and posttest N-gain test in small group trials

Average of pretest	Average of posttest	Maximum Score	Average difference	N - gain value	Criteria
59.1	80.8	100	21.7	0.55	Medium

Based on the table above, the N-gain test results for the pretest and posttest values can be seen that the average increase in the pretest and posttest is 0.55 with medium criteria. Besides, the average difference between pretest and posttest scores is 21.7.

The average increase in learning outcomes after using Canva-based infographic learning media can be calculated using the N-gain test. The test results for increasing the average value before learning and after learning can be presented in the following table.

Table 9. Result of the pretest and posttest N-gain test in large group

Average of Pretest	Average of Posttest	Maximum Score	Average Difference	N - Gain Value	Criteria
52.1	80	100	27.89	0.58	Medium

Based on the table above, the N-gain test results for the pretest and posttest values can be seen that the average increase in the pretest and posttest is 0.58 with

medium criteria. and the difference between the average pretest and posttest scores is 27.89.

Design Results for Canva-Based Infographic Learning Media Development

The results of the student response and teacher response questionnaires that have been filled in were then analyzed by calculating the average answer based on the suspension of each answer from the respondents. The score was converted into a percentage of media feasibility. Regarding the feasibility of Canva-based infographic learning media on human respiratory system material for IPAS fifth-grade students of elementary school, it is known that the media is declared very feasible based on the percentage results of material experts, media experts, student response questionnaires, and teacher response questionnaires.

Feasibility of Canva-Based Infographic Learning Media

Canva-based infographic learning media cannot be stated to be feasible if it has not been assessed by experts as well as responses from students and teachers who provide suggestions for creating the media. Media assessments are obtained from experts, including material and media experts.

The material expert gave a score of 52, with a percentage of 86.66% and according to the media eligibility criteria table. These results fall into the very appropriate criteria with criticism and suggestions from material experts. These can be used as a guide in revising process. Based on the material expert's assessment, it can be concluded that Canva-based infographic learning media is worth testing with revisions from the material expert's recommendations.

Furthermore, Canva-based infographic learning media also received an assessment from media experts to determine its suitability before being tested in the field. Media assessment by media experts used an instrument in the form of a rating scale, namely raw data obtained in the form of numbers and then interpreted in a qualitative sense. Media experts gave a score of 53, with a percentage of 88.3% and according to the media eligibility criteria table. These results fall into the very feasible criteria and can be tested in the field without revision.

Based on assessments from material experts and media experts, the suggestions for media developed by researchers for improvement are found. The input from the material expert is that the learning objectives are completed with the activities to be carried out, the trigger questions are adjusted and the material sub-chapters between separated learning 1 and learning 2.

The suitability of the media is also supported by the results of student and teacher responses after product trials in the field. The media was tested on a small group

of 6 (six) using a purposive sampling technique. In a small group trial, the students involved and the fifth-grade teacher were asked to fill out a student response questionnaire. The teacher response questionnaire aimed to assess the Canva-based infographic learning media product. As for the questionnaire results from student responses in small group trials, the total student response score was 79 out of a maximum score of 90. When converted into a percentage, it was 87.78% with very feasible criteria. Then, the results of the teacher response questionnaire in the small group trial obtained a score of 55 out of a maximum score of 60. When converted into a percentage, it is 91.67% with very feasible criteria.

Meanwhile, the large group trial was carried out on all fifth-grade students at SD Negeri Tambakaji 05. The questionnaire results of student responses in the large group trial showed that the total student response score is 248 out of a maximum score of 285. If converted into a percentage, it shows 87% with very adequate criteria. Furthermore, in the large group trial, the results of the teacher response questionnaire obtained a score of 56 out of a maximum score of 60. When converted into a percentage, it is 93% with very feasible criteria. Based on assessments from material experts, media experts, the results of student response questionnaires and teacher response questionnaires. These indicate that Canva-based infographic learning media is very suitable for use in the learning process of science lesson content on the Human Respiratory System.

Effectiveness of Canva-Based Infographic Learning Media

The effectiveness of Canva-based infographic learning media is determined by student learning outcomes in the cognitive domain. In this research, learning using Canva-based infographic learning media was carried out more than two meetings. The length of research time was adjusted to availability and input from the class teacher. Student learning outcomes in the cognitive domain were obtained from the results of the pretest and posttest scores. Pretest scores were obtained from student learning outcomes before using the media and without receiving treatment. Meanwhile, posttest scores were obtained from student learning outcomes after using the media and having received treatment. After using Canva-based infographic learning media, it is expected that changes will occur in students, that is changes for the better. The pretest results showed that there were five students who completed (26.31%) and fifteen students who did not complete (73.69%). Meanwhile, nineteen students (100%) completed the posttest. There was an average increase before and after using the media, the average increase in value is 73.69%. The value calculation is adjusted to the KKTP (Criteria for Completion of Learning Objectives) content of fifth-

grade in science lessons at SD Negeri Tambakaji 05, which was used as the research site. Students were considered to have completed the science course content if the student could achieve a minimum score of 65. These results indicate that there has been a positive change in the student and the learning has been declared successful. Referring to the statement stated by Djamah (2013) in Irmawati et al. (2020) that learning is said to be successful if 75% or more of the number of students who take part in the learning activity process reaches the level of success. If it has not reached the limit, then several steps must be taken, namely carrying out a remedial program.

In order to determine the effectiveness of Canva-based infographic learning media, the researchers also calculated the pretest and posttest scores using the t-test to find out whether there was a significant increase between the pretest and posttest scores. Before carrying out the t-test, the researcher first tested the normality of the data from the pretest and posttest scores. Test normality with Microsoft Excel 2019 Software using the Liliefors formula. From the results of the normality test in the small group trial, it shows that the pretest and posttest scores with a total of 6 students obtained $L_t 0.31$. The pretest L_o is 0.18, and the posttest L_o is 0.20. Thus, it can be concluded that the pretest value is $L_o (0.18) < L_t (0.31)$ and the posttest value is $L_o (0.20) < L_t (0.31)$. This means that the hypothesis is accepted or in other words, the data is normally distributed. Then, the normality test was carried out on the large group test, showing that the pretest and posttest scores with a total of 19 students obtained $L_t 0.19$, L_o pretest is 0.12 and L_o posttest is 0.13. It can be concluded that the pretest value $L_o (0.12) < L_t (0.19)$ and the posttest value $L_o (0.13) < L_t (0.19)$. Based on these data, it can be concluded that the pretest and posttest scores in small group trials and large group trials are normally distributed, so that the calculation of learning outcomes in this research was then carried out using parametric statistical techniques.

Based on the results of t-test calculations in small group trials and large group trials, it is known that $t\text{-count} > t\text{-table}$ ($3.55 > 2.30$) in small group trials and $t\text{-count} > t\text{-table}$ ($7.64 > 2.03$) in large group trials. Thus, H_0 is rejected and H_a accepted. Based on this result, there is a significant difference in student learning outcomes between before and after carrying out the learning process using Canva-based infographic learning media.

After carrying out the t-test, the N-gain calculation was used to analyze the average increase in student learning outcomes. It is known that there is an increase in the average learning outcomes after using Canva-based infographic learning media in small group and large group trials. The average increase in the pretest and posttest of the small group trial is 0.55. While the

average increase in the pretest and posttest of the large group trial is 0.58. Both of them were included in the medium criteria. Based on this discussion, it shows that Canva-based infographic learning media has an influence on student learning outcomes.

Conclusion

Based on the research that has been done, it can be concluded that Canva-based IPAS infographic learning media is feasible, practical and effective for use in learning activities. This is evidenced by the results of material expert validation obtaining an average percentage of 88.3% and media validation of 86.66% with a very feasible category. The average percentage of practicality in the large-scale product trial was 93% for teachers and 87% for students with a very practical category. Furthermore, the effectiveness of Canva-based IPAS infographic learning media is obtained from the learning outcomes of students through pre-test and post-test with an average difference of 27.89 and N-Gain 0.58 which is included in the moderate category.

Acknowledgments

The authors would like to thanks to University for give occasion for this research.

Author Contributions

S.R. and B.I.: investigation, formal analysis, resources, data curation, writing – original draft preparation, writing – review and editing, visualization, supervision, project administration, and funding acquisition. All authors have read and agreed to the published version of the manuscript.

Funding

This research is fully supported by the author's funds without any external funding sources.

Conflicts of Interest

We certify that there is no conflict of interest with any financial, personal, and other relationships with other peoples or organization related to the material discussed in the manuscript.

References

- Afolabi, F. (2021). Learning Styles: Tools for Understanding Media Selection and Learners' Academic Achievement in Physics. *Journal of Educational Sciences*, 5(4). <https://doi.org/10.31258/jes.5.4.p.584-597>
- Akib, E., Imran, M. E., Mahtari, S., Mahmud, M. R., Prawiyogy, A. G., Supriatna, I., & Ikhsan, M. T. H. (2020). Study on Implementation of Integrated Curriculum in Indonesia. *IJORER: International Journal of Recent Educational Research*, 1(1), 39-57. <https://doi.org/10.46245/ijorer.v1i1.24>
- Alenezi, M., Wardat, S., & Akour, M. (2023). The Need of Integrating Digital Education in Higher Education: Challenges and Opportunities. *Sustainability (Switzerland)*, 15(6). <https://doi.org/10.3390/su15064782>
- Alles, M., Seidel, T., & Gröschner, A. (2019). Establishing a Positive Learning Atmosphere and Conversation Culture in the Context of a Video-Based Teacher Learning Community. *Professional Development in Education*, 45(2). <https://doi.org/10.1080/19415257.2018.1430049>
- Arsyad, A. (2020). *Media Pembelajaran*. Jakarta: PT. Rajagrafindo Persada.
- Astiti, N. D., Mahadewi, L. P. P., & Suarjana, I. M. (2021). Faktor yang Mempengaruhi Hasil Belajar IPA. *Mimbar Ilmu*, 26(2), 193. <https://doi.org/10.23887/mi.v26i2.35688>
- Balakrishnan, V., & Gan, C. L. (2016). Students' Learning Styles and Their Effects on the Use of Social Media Technology for Learning. *Telematics and Informatics*, 33(3). <https://doi.org/10.1016/j.tele.2015.12.004>
- Bonastra, Q., & Jové, G. (2022). Rethinking Learning Contexts Through the Concept of Atmosphere and Through Contemporary Art. *Journal of Geography in Higher Education*, 46(3). <https://doi.org/10.1080/03098265.2021.1902959>
- Dewi, A. C., Adi, E. P., & Abidin, Z. (2021). Pengembangan Infografis Melalui Instagram Sebagai Penguatan Pemahaman Pokok Bahasan Sistem Pencernaan Manusia. *JKTP: Jurnal Kajian Teknologi Pendidikan*, 4(2), 216-224. <https://doi.org/10.17977/um038v4i22021p216>
- Dewi, I. M., & Setyasto, N. (2024). Development of Canva-Based Digital Flipbook Learning Media for IPAS Subject on Respiratory System. *Jurnal Penelitian Pendidikan IPA*, 10(5), 2300-2308. <https://doi.org/10.29303/jppipa.v10i5.7030>
- Elhawwa, T. (2022). The Effect of the Learners' Perception on Motivation, Teaching Method, Discipline, Learning Style, and Learning Atmosphere toward Writing Achievement at Islamic University Students. *Language Circle: Journal of Language and Literature*, 16(2). <https://doi.org/10.15294/lc.v16i2.33880>
- Fajari, L. E. W., Sarwanto, S., & Chumdari, C. (2020). The Effect of Problem-Based Learning Multimedia and Picture Media on Students' Critical-Thinking Skills Viewed from Learning Motivation and Learning Styles in Elementary School. *Elementary Education Online*, 19(3). <https://doi.org/10.17051/ilkonline.2020.735165>
- Firdaus, A. F., Maryuni, Y., & Nurhasanah, A. (2021). Pengembangan Infografis Berbasis Android sebagai Media Pembelajaran Sejarah (Materi

- Sejarah Revolusi Indonesia). *Candrasangkala: Jurnal Pendidikan dan Sejarah*, 7(1), 23–33. <http://dx.doi.org/10.30870/candrasangkala.v7i1.11417>
- Gusnarib, G., & Rosnawati, R. (2021). *Teori-Teori Belajar dan Pembelajaran*. Indramayu: CV. Adanu Abimata.
- Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the Role of Digital Technologies in Education: A Review. *Sustainable Operations and Computers*, 3. <https://doi.org/10.1016/j.susoc.2022.05.004>
- Irmawati, H., Sulistyaningrum, C. D., & Subarno, A. (2020). Pengaruh Partisipasi Siswa dalam Ekstrakurikuler dan Keaktifan Belajar terhadap Kemampuan Komunikasi Siswa Kelas X OTKP SMK Negeri 6 Surakarta Tahun Ajaran 2019/2020. *Informasi dan Komunikasi Administrasi Perkantoran*, 4(3), 109–116. <https://doi.org/10.20961/jikap.v4i3.46888>
- Janssens, L., Kuppens, T., Mulà, I., Staniskiene, E., & Zimmermann, A. B. (2022). Do European Quality Assurance Frameworks Support Integration of Transformative Learning for Sustainable Development in Higher Education? *International Journal of Sustainability in Higher Education*, 23(8). <https://doi.org/10.1108/IJSHE-07-2021-0273>
- Kurniawan, F., Gunawan, R., & Qodariah, L. (2022). The Relationship of Infographic Learning Media and Instagram Media to Students' Digital Literacy Ability in Social Studies Learning at SMP Shidqia Islamic School Bekasi. *Edumaspul: Jurnal Pendidikan*, 6(2). <https://doi.org/10.33487/edumaspul.v6i2.4555>
- Laswadi, L., Supriadi, N., Khaidir, C., & Anggoro, B. S. (2022). Investigating the Effectiveness of Using Various Mathematics Learning Media Among Students with Various Learning Styles. *Al-Jabar: Jurnal Pendidikan Matematika*, 13(1). <https://doi.org/10.24042/ajpm.v13i1.12485>
- Li, B., Sjöström, J., Ding, B., & Eilks, I. (2023). Education for Sustainability Meets Confucianism in Science Education. *Science and Education*, 32(4). <https://doi.org/10.1007/s11191-022-00349-9>
- Mawardani, E., Vitasari, M., & Berlian, L. (2022). Validity of Infographic Learning Media Theme of Green Growth in Training Critical Thinking Skills. *Jurnal Pena Sains*, 9(1). <https://doi.org/10.21107/jps.v9i1.13721>
- Michels, C., Hindley, C., Knowles, D., & Ruth, D. (2020). Learning Atmospheres: Re-Imagining Management Education Through the Dérive. *Management Learning*, 51(5). <https://doi.org/10.1177/1350507620906673>
- Miranda, J., Navarrete, C., Noguez, J., Molina-Espinosa, J. M., Ramírez-Montoya, M. S., Navarro-Tuch, S. A., Bustamante-Bello, M. R., Rosas-Fernández, J. B., & Molina, A. (2021). The Core Components of Education 4.0 in Higher Education: Three Case Studies in Engineering Education. *Computers and Electrical Engineering*, 93. <https://doi.org/10.1016/j.compeleceng.2021.107278>
- Neves, D. T., & Giorgi, C. A. G. (2022). Whose Responsibility? An Analysis of the Perspectives for the Educational Responsibility Law Foreword in the National Education Plan. *Ensaio.*, 30(114). <https://doi.org/10.1590/S0104-40362021002902469>
- Nur, H. M., & Fatonah, N. (2022). Paradigma Kompetensi Guru. *Jurnal PGSD UNIGA*, 1(1). <http://dx.doi.org/10.52434/jpgsd.v1i1.1561>
- Nurfadhilah, N., Khaeruddin, K., & Usman, U. (2023). Application of Physics Infographic Learning Media to Student Graphic Interpretation Ability at Straight Motion Topic. *Berkala Ilmiah Pendidikan Fisika*, 11(1). <https://doi.org/10.20527/bipf.v11i1.15490>
- Nurmalisa, Y., Sunyono, S., Yulianti, D., & Sinaga, R. M. (2023). An Integrative Review: Application of Digital Learning Media to Developing Learning Styles Preference. *International Journal of Information and Education Technology*, 13(1). <https://doi.org/10.18178/ijiet.2023.13.1.1795>
- Purnasari, P. D., & Sadewo, Y. D. (2021). Strategi Pembelajaran Pendidikan Dasar di Perbatasan pada Era Digital. *Jurnal Basicedu*, 5(5), 3089–3100. <https://doi.org/10.31004/basicedu.v5i5.1218>
- Rahman, N., Maemunah, M., Haifaturrahmah, H., & Fujiaturahmah, S. (2020). Pelatihan Pengembangan Media Pembelajaran Berbasis Web bagi Guru SMP. *Journal of Character Education Society*, 3(3), 621–630. <https://doi.org/10.31764/jces.v3i3.2793>
- Rosyid, Y. R. R., & Setyasto, N. (2024). Development of Android-Based Augmented Reality Learning Media on the Human Respiratory System to Improve Student Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, 10(5), 2503–2510. <https://doi.org/10.29303/jppipa.v10i5.7024>
- Saputra, A. (2018). Allocation of Education Budget in Indonesia. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences*, 1(2). <https://doi.org/10.33258/birci.v1i2.19>
- Shamsuddin, N., & Kaur, J. (2020). Students' Learning Style and Its Effect on Blended Learning, Does It Matter? *International Journal of Evaluation and Research in Education*, 9(1). <https://doi.org/10.11591/ijere.v9i1.20422>
- Shen, Y., Heng, R., & Qian, D. (2020). Smart Classroom Learning Atmosphere Monitoring Based on FPGA and Convolutional Neural Network. *Microprocessors and Microsystems*. <https://doi.org/>

- 10.1016/j.micpro.2020.103488
- Shukshina, L. V., Gegel, L. A., Erofeeva, M. A., Levina, I. D., Chugaeva, U. Y., & Nikitin, O. D. (2021). STEM and STEAM Education in Russian Education: Conceptual Framework. *Eurasia Journal of Mathematics. Science and Technology Education*, 17(10). <https://doi.org/10.29333/ejmste/11184>
- Simamora, C. P., & Songgirin, A. (2023). Legal Compliance of Education Providers Against Article 53 Paragraph (1) of Law No. 20 of 2003 Concerning the National Education System (Case Study: M3 Vocational High School). *Sinergi International Journal of Law*, 1(1). <https://doi.org/10.61194/law.v1i1.42>
- Suendarti, M., & Virgana, V. (2022). Elevating Natural Science Learning Results Through Music Media and Students' Learning Style. *Cypriot Journal of Educational Sciences*, 17(11). <https://doi.org/10.18844/cjes.v17i11.7560>
- Sugiyono, P. D. (2020). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta.
- Sugiyono, P. D. (2019). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta.
- Yusuf, O. Y. H., Aprianti, F., Mayasari, D., Satriwati, S., & Balula, W. E. (2023). Educator and Student Interaction in a Classroom Learning Atmosphere. *AURELIA: Jurnal Penelitian dan Pengabdian Masyarakat Indonesia*, 2(1). <https://doi.org/10.57235/aurelia.v2i1.309>
- Zakiah, A. (2019). *Pengaruh Gaya Belajar terhadap Minat Belajar Siswa di Madrasah Ibtidaiyah Negeri 1 Tulungagung* (Undergraduate Thesis). Universitas Islam Negeri Sayyid Ali Rahmatullah Tulungagung. Retrieved from <http://repo.uinsatu.ac.id/11335/>