Journal of Education Technology
Volume 8, Number 2, 2024, pp. 205-214
P-ISSN: 2549-4856 E-ISSN: 2549-8290
Open Access: https://ejournal.undiksha.ac.id/index.php/JET

Digital Innovation: Teaching Materials with Clean Air for Health Theme for Fifth Grade Elementary School

Ni Wayan Rati[1*], I Gusti Ayu Tri Agustiana[2], Ni Made Dyan Anggreni[3]
[1,2,3] Universitas Pendidikan Ganesha, Singaraja, Indonesia

ARTICLE INFO

Article history:
Received October 31, 2023
Accepted April 12, 2024
Available online May 25, 2024

Kata Kunci:
Bahan Ajar Digital, Penelitian Pengembangan, Sekolah Dasar

Keywords:
Digital Teaching Materials, Development Research, Elementary Schools

DOI:
https://doi.org/10.23887/jet.v8i2.69760

ABSTRAK

Bahan ajar adalah faktor pendukung yang wajib ada dalam pembelajaran. Salah satu solusi yang dapat dilakukan guru dalam mendukung kegiatan pembelajaran mandiri oleh peserta didik adalah dengan menyediakan bahan ajar digital yang dapat digunakan oleh peserta didik kapan dan dimanapun. Penelitian yang dilakukan ini adalah penelitian pengembangan, yang bertujuan untuk mengembangkan bahan ajar digital untuk peserta didik kelas V sekolah dasar. Penelitian pengembangan dengan menggunakan model pengembangan 4D (Define, Design, Develop, Disseminate). Metode pengumpulan data yang dipergunakan dalam penelitian ini adalah metode angket atau kuesioner. Uji coba produk dilakukan melalui penilaian para ahli dan praktisi (3 orang ahli dan 2 orang praktisi) untuk mengetahui validitas dari bahan ajar yang dikembangkan. Selain menguji validitas juga dilakukan uji coba dalam kelompok kecil untuk mengetahui kepraktisan dari bahan ajar yang dikembangkan. Analisis data dengan menggunakan dua teknik analisis (metode kombinasi) yakni teknik analisis data deskriptif dan inferensial. Hasil penelitian menunjukan bahan ajar yang dikembangkan berada pada kategori validitas sangat tinggi dan berdasarkan respon dari pengguna baik guru maupun peserta didik berkenaan dengan keperaktisan, bahwa bahan ajar yang dikembangkan berada pada kategori sangat praktis.

ABSTRACT

Teaching materials are supporting factors that must exist in learning. One solution that teachers can do to support independent learning activities by students is to provide digital teaching materials that can be used by students anytime and anywhere. This research is development research, which aims to develop digital teaching materials for fifth grade elementary school students. Development research is using the 4D development model (Define, Design, Develop, Disseminate). The data collection method used in this study is a questionnaire or questionnaire method. Product trials were carried out through the assessment of experts and practitioners (3 experts and 2 practitioners) to determine the validity of the teaching materials developed. In addition to testing the validity, trials were also carried out in small groups to find out the practicality of the teaching materials being developed. Data analysis used two analytical techniques (combination method), namely descriptive and inferential data analysis techniques. The results showed that the teaching materials developed were in the category of very high validity and based on the responses from users, both teachers and students regarding practicality, that the teaching materials developed were in the very practical category.

1. INTRODUCTION

Education is an effort that is well planned and optimal so that students are able to compete actively in exploring the abilities that exist in each student, so that the goals of national education can be achieved (Khunaifi & Matlani, 2019; Mulyati, 2022). 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 character, and skills needed by themselves, society, nation and state as set forth in Article 1 paragraph (1) of Law Number 20 of 2003 concerning the National Education System (Estriyanto et al., 2017; Khunaifi & Matlani, 2019). As emphasized in Permendikbud number 103 of 2014 concerning learning in basic education and secondary education that the learning process is carried out in an interactive, fun, challenging, inspiring manner, motivating students to participate actively, and providing sufficient space for initiative, creativity, and independence in accordance with with the talents, interests, abilities, and physical and psychological development of students (Bahri, 2017; Stuchlikova, 2016). To realize the learning process as stated in the Minister of Education and Culture Number 103 of 2014, the role of a teacher is needed. Teachers play an important role in the success of a learning activity. Teachers are required to be able to use technology to support learning activities, find learning resources and develop teaching materials. Teachers are required to have skills in developing various aspects of learning, such as making media, teaching materials, and developing learning strategies and methods needed by students (Hau et al., 2020; Morrar et al., 2017). The success of a learning is also determined by the

** Corresponding Author: Ni Wayan Rati: niwayan.rati@undiksha.ac.id*

supporting devices in learning activities. One of the learning tools that can support the success of a learning activity is teaching materials (Hau et al., 2020; Vastyanov et al., 2021). Teaching materials are supporting factors that must be present in learning, with the aim that teachers can be helped when explaining material and students do not find it difficult to understand the material to be studied, so that students are able to achieve basic competencies optimally (Nurjanah et al., 2017; Taufan, 2022). Teaching materials can help students to understand the material through independent learning activities.

This independence in needs to be given to students so that they have responsibility in managing and disciplining themselves and in developing the ability to learn on their own accord (Asmar & Delyana, 2020; Wijayanti & Pratomo, 2019). The most important thing in the independent learning process is increasing the abilities and skills of students in the learning process without the help of others, so that in the end students do not depend on teachers, mentors, friends or other people in learning (Martín-Aragoneses et al., 2021; Yang et al., 2018). So that students can carry out independent learning activities in their respective homes or where they want, teaching materials are needed that can help them to understand the material.

One solution that teachers can do to support independent learning activities by students is to provide digital teaching materials that can be used by students anytime and anywhere. Students can also repeat learning according to their wishes by using digital teaching materials (Morrar et al., 2017; Nawaz & Ghulam, 2010). Digital teaching materials equipped with learning videos are urgently needed for students on the theme of clean air for health. With this digital teaching material, it can present abstract concepts that can be seen by students through animated videos (Abdurrahmansyah et al., 2022; Karuniasih, 2022). The purpose of the research conducted was to describe and explain the validity and practicality of digital teaching materials on the Theme Clean Air for Health for class V elementary school cluster III, Buleleng District.

2. METHOD

This research is development research, which aims to develop digital teaching materials for fifth grade elementary school students. Development research using the 4D development model (Define, Design, Develop, Disseminate) (Amalia & Fajar, 2021; Putri et al., 2022). This research will be carried out in the odd semester of 2023/2024 at Gugus III Elementary School, Buleleng District, Buleleng Regency by implementing digital teaching materials developed to obtain data on teacher and student responses. The data collection method used in this study was a questionnaire or questionnaire method by providing a number of lists of questions and written statements to respondents. Questionnaires were given to experts to obtain data about the validity of the developed teaching materials, questionnaires were given to practitioners and students to obtain data about the practicality of the developed teaching materials. This data is then processed by giving meaning to each data. In this study is using an instrument in the form of a rating scale. The rating scale is a research instrument using a scale from low to high. The instruments used in this study range from a scale of 1-5. Table 1 shows the questionnaire sheet validity of teaching materials.

Table 1. Teaching Materials Validity Questionnaire Sheet

No	Aspect	Indicators	Score				
			5	4	3	2	1
1	Cover	1. The cover of the teaching material is interesting.					
		2. The cover color composition of the teaching materials is correct.					
		3. The composition/layout of the writing is balanced.					
		4. The cover reflects the content of teaching materials.					
2	Grammar	1. Compatibility of writing with EYD.					
		2. Numbering is clear and precise.					
		3. Use of effective and communicative language					
		4. Writing on teaching materials can be read clearly.					
3	Content	1. Clarity of description of the material on teaching materials.					
		2. The truth of the concept conveyed.					
		3. Learning materials are easy to understand.					
		4. Relevant to the 2013 Curriculum.					
		5. Teaching materials are in accordance with KD and indicators.					
		6. Material that is relevant to the conditions and real life of students					
		7. The material is arranged systematically.					
		8. Use of appropriate terms.					

For data related to the practicality of teaching materials obtained from the responses of practitioners (teachers) and students. In Table 2, the Teaching Material Practicality Questionnaire Sheet is presented.

Table 2. Questionnaire on Practicality of Teaching Materials for Practitioners

No	Aspect	Indicators	Score				
			5	4	3	2	1
1	Format	1. The cover of the teaching material is interesting.					
		2. The cover color composition of the teaching materials is correct.					
		3. The composition/layout of the writing is balanced.					
		4. The cover reflects the content of teaching materials.					
		5. The format of teaching materials is appropriate.					
2	Grammar	1. The grammar used in teaching materials is in accordance with the EYD.					
		2. Numbering is clear and precise.					
		3. The language used in teaching materials is effective and communicative					
		4. Writing on teaching materials can be read clearly.					
3	Content	1. The material in teaching materials is clearly described.					
		2. The concepts conveyed in teaching materials are correct and can be accounted for.					
		3. Learning materials in teaching materials are easy to understand.					
		4. Relevant to the 2013 Curriculum.					
		5. Teaching materials are in accordance with KD and indicators.					
		6. Material that is relevant to the conditions and real life of students					
		7. The material is arranged systematically.					
		8. The use of terms in teaching materials is appropriate.					

Before the instrument for collecting data in this study was used, content validity was first tested so that later the research instrument was feasible to be used to collect research data. Test the validity of the content by asking the opinions of experts (judgment experts). Furthermore, from the results of the expert assessment, an analysis was carried out using the Gregory formula as follows. The calculation results of the Gregory formula are then matched in Table 3 to the criteria to determine the level of content validity of the instrument.

Table 3. Instrument Content Validity

Coefficient	Validity
0.80−1.0	Content validity is very high.
0.60−0.80	High content validity.
0.40−0.60	Content validity is sufficient.
0.20−0.40	Low content validity.
0.00−0.20	Content validity is very low.

The instrument validity assessment sheet for teaching materials before being used to collect data is first tested for the validity of the instrument. Product trials were carried out through the assessment of experts and practitioners (3 experts and 2 practitioners) to determine the validity of the teaching materials developed. In addition to testing the validity, trials were also carried out in small groups to find out the practicality of the teaching materials being developed. Data analysis used two analytical techniques (combination method), namely descriptive and inferential data analysis techniques (Sugiyono, 2016). Descriptive analysis methods are used to process data in the form of input and suggestions from judges on the digital teaching materials being developed. Then the results of the expert's review are used as material for improving teaching materials. The revised product is then tested in the field by implementing the teaching materials developed in class. Inferential statistical analysis is used to process data in the form of numbers. Product validity data obtained, analyzed using the Aiken validation index formula. Furthermore, to interpret the value of content validity obtained from the results of calculations using the Aiken formula, the classification is used as shown in Table 4.

Table 4. Aiken Validity Criteria

Validity Result	Validity Criteria
$0.80 < V \leq 1.00$	Very high
$0.60 < V \leq 0.80$	High
$0.40 < V \leq 0.60$	Enough

0.20 < V≤ 0.40	Low
0.00 < V≤ 0.20	Very low

Product eligibility criteria if it achieves a minimum score of 80% with practical qualifications. If it does not meet these criteria, the product must be revised according to the validator's input and directions. Product practicality conversion guidelines are shown in Table 5.

Table 5. Product Practicality Conversion Guidelines

No.	Score Range (%)	Qualification
1	90 - 100	Very Practical
2	80 - 89	Practical
3	65 - 79	Pretty Practical
4	55 - 64	Less Practical
5	0 - 54	Very Less Practical

3. RESULT AND DISCUSSION

Result

This research was conducted to develop a digital teaching material on the Theme of Clean Air for Health for fifth grade elementary school. Teaching materials are developed according to the steps of the research design used, namely 4D. Before the teaching materials are developed, a needs analysis is first carried out.

Define Stage

This stage begins with finding and analyzing the problems faced in learning, especially in teaching materials, then formulating solutions that can be done to overcome these problems. The results of the needs analysis related to teaching materials can be presented as follows. Teaching materials used by teachers and students are in accordance with the teacher's book and student book. In addition, at this stage an assessment was carried out related to the characteristics of class V students. Concept analysis was in accordance with the 2013 curriculum that applies to class V SD. The theme of clean air for health includes three sub-themes consisting of: sub-theme 1 how the body processes clean air, sub-theme 2 the importance of clean air for breathing, and sub-theme 3 maintaining the health of human respiratory organs how to maintain respiratory organs. Based on the search results and interviews, it is known that the assignments given by the teacher tend to be the assignments in the student's book. Giving assignments by teachers who are less innovative can make students quickly get bored in the learning process. Providing interesting and innovative assignments aims to make students feel challenged in learning and students also feel the learning process is more meaningful. The teaching materials developed are also equipped with assignments that can be done independently by students. In order to better direct the contents of the teaching materials and also to focus on the teaching materials being developed, learning objectives are formulated.

Teaching Material Validity

The validity of teaching materials was obtained from the assessment of three experts who were competent in their fields. The results of the assessment of the three experts are presented as shown in Table 6.

Table 6. Results of the Assessment of the Validity of Teaching Materials by Experts

Aspect	Indicators	Expert 1	Expert 2	Expert 3	Average
Cover	1. The cover of the teaching material is interesting.	5	5	5	5
	2. The cover color composition of the teaching materials is correct.	5	5	5	5
	3. The composition/layout of the writing is balanced.	5	5	4	4.67
	4. The cover reflects the content of teaching materials.	5	5	5	5
Grammar	1. Compatibility of writing with EYD.	5	5	5	5
	2. Numbering is clear and precise.	5	5	4	4.67
	3. Use of effective and communicative language	5	5	4	4.67
	4. Writing on teaching materials can be read clearly.	4	5	5	4.67
Content	1. Clarity of description of the material on teaching materials	4	5	4	4.33
	2. The truth of the concept conveyed.	5	5	4	4.67
	3. Learning materials are easy to understand.	4	5	5	4.67
	4. Relevant to the 2013 Curriculum.	5	5	5	5

Aspect	Indicators	Expert 1	Expert 2	Expert 3	Average
	5. Teaching materials are in accordance with KD and indicators.	5	4	4	4.33
	6. Material that is relevant to the conditions and real life of students.	4	4	5	4.33
	7. The material is arranged systematically.	5	5	5	5
	8. Use of appropriate terms.	5	5	5	5

Based on the results of the analysis obtained from Aiken's calculations, in Table 7 a summary of the results of the calculations is presented.

Table 7. Summary of Aiken Validity

No	Indicators	V	Description
1	Cover	0.979	Very Valid
2	Grammar	0.937	Very Valid
3	Content	0.812	Very Valid
Average Rating Total		**0.909**	**Very Valid**

Based on Table 7 it is known that the total average value of teaching material validity is 0.909. So when viewed with the validity criteria of the Aiken V index, this value belongs to the "Very High" category of validity ($0.80 < V \leq 1.00$). This means that the three experts provide a consistent assessment and in accordance with the indicators.

Practicality of Teaching Materials

Data related to the practicality of teaching materials were obtained from the assessment of 2 practitioners, namely the fifth grade teacher at SDN I Banjar Jawa and the responses of the students. The complete assessment of practitioners is presented in Table 8.

Table 8. Results of Teaching Materials Practicality Assessment

Aspect	Indicators	Amount	Average
Format	1. The cover of the teaching material is interesting.	10	5
	2. The cover color composition of the teaching materials is correct.	10	5
	3. The composition/layout of the writing is balanced.	10	5
	4. The cover reflects the content of teaching materials.	10	5
	5. The format of teaching materials is appropriate.	10	5
Grammar	1. The grammar used in teaching materials is in accordance with the EYD.	10	5
	2. Numbering clarity and accuracy.	10	5
	3. The language used in teaching materials is effective and communicative	10	5
	4. Readability of writing on teaching materials.	10	5
Content	1. The material in teaching materials is clearly described.	9	4,5
	2. The concepts conveyed in teaching materials are correct and can be accounted for.	10	5
	3. Learning materials in teaching materials are easy to understand.	10	5
	4. Relevant to the 2013 Curriculum.	10	5
	5. Conformity of teaching materials with KD and indicators.	10	5
	6. The relevance of the material to the conditions and real life of students	10	5
	7. The material is arranged systematically.	10	5
	8. The accuracy of the use of terms.	10	5
Amount			
Practical Value			

To determine the level of practicality of the developed teaching materials, the results of the above calculations are converted according to Table 8. Based on the conversion results the developed teaching materials are in the very practical category. The following in Table 9 is presented in full by students' responses to the teaching materials developed. Teaching materials were responded to by 68 students.

Table 9. Student Responses to Teaching Materials

Aspect	Indicators	Amount	Average
Format	1. In my opinion, the instructions for using the teaching materials listed can be clearly understood.	321	4.72
	2. In my opinion, the cover design of this teaching material is in accordance with the contents of the teaching material and is interesting to look at.	328	4.82
	3. In my opinion the composition/layout of the writing is balanced.	328	4.82
Grammar	1. In my opinion, the language used in teaching materials is in accordance with the child's developmental level.	338	4.97
	2. The language used in teaching materials is effective and communicative	335	4.93
	3. Writing on teaching materials can be read clearly and easily understood.	337	4.96
Content	1. In my opinion, the material presented in the teaching materials can be read well.	337	4.96
	2. In my opinion the material presented in the teaching materials is in accordance with the KD of each learning content integrated in the 2013 Curriculum.	337	4.96
	3. In my opinion, the material in teaching materials is arranged systematically.	338	4.97
	4. In my opinion, videos on teaching materials can help students to better understand the material.	337	4.96
	5. In my opinion, the illustrations presented in the teaching materials are appropriate and can support the delivery of the material discussed.	336	4.94
	6. In my opinion, the designed teaching materials can help students understand the material on the theme Clean Air for Health.	330	4.85
Amount		**4002**	**58.85**
Practical Value		**98.09%**	

To determine the level of practicality of the developed teaching materials, the results of the above calculations are converted according to Table 9. Based on the results of the conversion of the developed teaching materials, they are in the very practical category.

Revision Stage

Based on the results of the judges test that has been carried out on the teaching material validation instrument, several inputs were obtained related to grammar. The following are some of the improvements presented in Table 10.

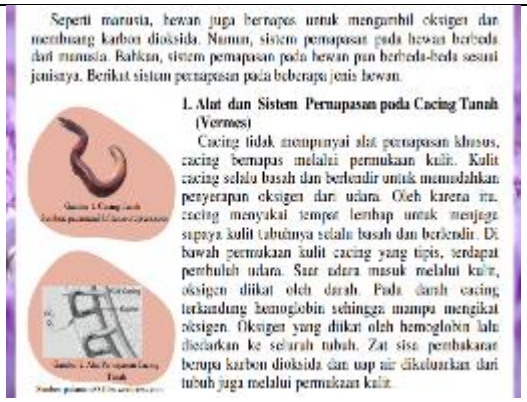
Table 10. Instrument Revision

No	Before	After
1	Indicator "Numbering is clear and precise" on the aspect of writing.	Clarity and completeness of numbering.
2	On the indicator "Writing on teaching materials can be read clearly" on the aspect of writing.	Readability of writing on teaching materials.
3	On the indicator "Relevant to the 2013 curriculum" on the aspect of content/material.	Material relevance to the 2013 curriculum.
4	On the indicator "Teaching materials according to KD and indicators" on the content/material aspect.	Conformity of teaching materials with KD and indicators.
5	On the indicator "Material that is relevant to the conditions and real life of students" on the content/material aspect.	The relevance of the material to the conditions and real life of students.
6	On the indicator "Use of appropriate terms" on the aspect of content/material.	Accurate use of terms.

After testing the validity of the developed teaching materials, there were several suggestions for improvement given by the experts. In Table 11, the improvements are presented in detail.

Table 11. Improvement of Teaching Materials

No	Before	After
1		
	The formulation of learning objectives should follow the ABCD format and be neatly arranged.	
2		
	The background contrast of the writing "Breathing in Animals" is noted	
3		
	Learning videos complete with titles	

No	Before	After
4	 Each picture complete with a sentence that refers to the picture.	

Based on Table 11, the teaching materials developed after being revised according to input from experts were then made into Plif books. The following is a link to the revised teaching materials https://online.flipbuilder.com/wpafn/ajhl/.

Discussion

Based on the results of the data analysis carried out in this study by considering three aspects, namely format, writing and material aspects, it was found that the teaching materials developed were in the very high validity category and based on responses from users, both teachers and students with regard to practicality, that The teaching materials developed are in the very practical category.

Teaching Material Validity

Teaching materials are a component of learning tools that are prepared in a planned and structured manner, which can be in the form of printed, audio, visual, or interactive teaching materials, which are used in the learning process by both teachers and students to achieve learning objectives (Asysyura et al., 2023; Saraswati et al., 2019). In accordance with what was stated by previous study state that in order to compile a good teaching material the following steps are taken. (1) Concept analysis, (2) Task analysis, (3) Selection of formats, and (4) Design of teaching materials (Winatha et al., 2018). This teaching material in the process of its preparation has followed according to these steps. Ideal teaching materials for optimizing student engagement and knowledge transfer should be prepared based on student needs, instructional design and hierarchy, and multimedia learning theory (Campilla & Castañaga, 2021; Fitriani, 2014). Teaching materials are a decomposed form of curriculum content which can be conveyed in detail, clearly with full illustrations, or conversely it can be made as necessary (Hakim, 2018; Hau et al., 2020). The teaching materials developed are in a very valid category. This shows that according to what was stated by previous study the criteria for evaluating quality teaching materials must fulfill four aspects of eligibility, namely (1) the feasibility of the content or coverage of material in accordance with the curriculum, (2) the eligibility presentation meets learning principles, (3) language feasibility, and (4) format or graphic feasibility (Bystrova, 2020; Heru, 2018). Based on the results of the analysis of the questionnaire distributed, this teaching material meets these criteria.

Practicality of Teaching Materials

The practicality of teaching materials can be seen from two aspects, namely from the responses or assessments given by practitioners (teachers) and from the responses or responses given by students to the teaching materials being developed. Based on the results of the data analysis related to practicality, it was found that the teaching materials developed were in the very practical category. As stated by previous study state that teaching materials should be developed according to the curriculum, likewise the teaching materials developed have been adapted to the curriculum that applies in class V, namely the 2013 Curriculum (Syafii, 2017). The suitability of teaching materials with the curriculum can help students to learn and understand the material better. In addition to conformity with the curriculum, the teaching materials developed must also be adapted to the characteristics of students. Regarding the characteristics of elementary school students where they are at the concrete operational stage, teaching materials accompanied by pictures and learning videos are the right thing to do. Likewise, the teaching materials developed are equipped with images that are relevant to the material discussed, also equipped with learning videos that can make it easier to understand the material (Raysha et al., 2020; Setiawan et al., 2020).

Teaching materials developed can be categorized as teaching materials that are practical to use. If seen from the format of writing this teaching material has clear instructions for use, to make it easier for students to use teaching materials clear instructions are needed to guide them. The cover design is attractive and in accordance with the content of the material in teaching materials, it is very important to note that students will be interested in reading the material if the cover has caught their interest. In addition to clear instructions and an attractive cover, it is necessary to pay attention to the appropriate and attractive composition or layout of images and text.

4. CONCLUSION

Based on the results of the data analysis carried out in this study by considering three aspects, namely format, writing and material aspects, it was found that the teaching materials developed were in the very high validity category and based on responses from users, both teachers and students with regard to practicality, that The teaching materials developed are in the very practical category. The teaching materials developed are in the very valid category. This shows that according to the criteria for evaluating quality teaching materials, they must fulfill four aspects of eligibility, namely (1) the feasibility of the content or coverage of the material in accordance with the curriculum, (2) the eligibility of the presentation fulfills the learning principles, (3) language feasibility, and (4) format or graphic feasibility. Practicality of Teaching Materials The practicality of teaching materials can be seen from two aspects, namely from the response or assessment given by practitioners (teachers) and from the responses or responses given by students to the teaching materials developed.

5. REFERENCES

Abdurrahmansyah, A., Sugilar, H., Ismail, I., & Warna, D. (2022). Online Learning Phenomenon: From the Perspective of Learning Facilities, Curriculum, and Character of Elementary School Students. *Education Sciences*, *12*(8). https://doi.org/10.3390/educsci12080508.

Amalia, A., & Fajar, D. M. (2021). Pengembangan E-book Interaktif Sebagai Sumber Belajar Mandiri Pada Materi Pemuaian Kelas VII SMP/MTs. *VEKTOR: Jurnal Pendidikan IPA*, *2*(2), 88–95. https://doi.org/10.35719/vektor.v2i2.46.

Asmar, A., & Delyana, H. (2020). Hubungan Kemandirian Belajar Terhadap Kemampuan Berpikir Kritis Melalui Penggunaan Software Geogebra. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *9*(2), 221–230. https://doi.org/10.24127/ajpm.v9i2.2758.

Asysyura, F., Adnan, A., & Faisal, F. (2023). The Effect of Interactive Multimedia on Students' Cognitive Learning Outcomes on System Materials. *Biodidaktika : Jurnal Biologi Dan Pembelajarannya*, *18*(1), 9. https://doi.org/10.30870/biodidaktika.v18i1.17808.

Bahri, S. (2017). Pengembangan Kurikulum Dasar Dan Tujuannya. *Jurnal Ilmiah Islam Futura*, *11*(1), 15. https://doi.org/10.22373/jiif.v11i1.61.

Bystrova, T. (2020). Infographics As a Tool for Improving Effectiveness of Education. *KnE Social Sciences*, *2020*, 152–158. https://doi.org/10.18502/kss.v4i13.7710.

Campilla, J., & Castañaga, A. (2021). Teaching Strategies Utilized by Mathematics Teachers in the 21 st-Century. *International Journal of Sciences: Basic and Applied Research (IJSBAR) International Journal of Sciences: Basic and Applied Research*, *59*(2), 140–160. https://doi.org/10.31002/ijome.v5i2.6588.

Estriyanto, Y., Kersten, S., Pardjono, P., & Sofyan, H. (2017). The missing productive vocational high school teacher competency standard in the Indonesian education system. *Journal of Technical Education and Training*, *9*(1), 6–14. https://doi.org/Retrieved from https://publisher.uthm.edu.my/ojs/index.php/JTET/article/view/1499.

Fitriani, A. D. (2014). Pengembangan Multimedia Interaktif Dalam Pembelajaran Geometri Untuk Meningkatkan Kemampuan Komunikasi Calon Guru Sekolah Dasar. *Edutech*, *13*(2), 236. https://doi.org/10.17509/edutech.v13i2.3105.

Hakim, L. (2018). Pengembangan Media Pembelajaran Pai Berbasis Augmented Reality. *Lentera Pendidikan : Jurnal Ilmu Tarbiyah Dan Keguruan*, *21*(1), 59–72. https://doi.org/10.24252/lp.2018v21n1i6.

Hau, N. H., Cuong, T. V., & Tinh, T. T. (2020). Students and Teachers' Perspective Of The Importance Of Arts In STEAM Education In Vietnam. *Journal of Critical Reviews*, *7*(11), 666–671. https://doi.org/10.31838/jcr.07.11.121.

Heru. (2018). Pengembangan Multimedia Game Pembelajaran Matematika SMP. *JMEN (Jurnal Math Educator Nusantara)*, *4*(1), 1–14. https://doi.org/10.29407/jmen.v4i01.12003.

Karuniasih, N. L. A. G. (2022). Exploring Readiness of Teachers Toward English Remote Teaching. *Journal of Educational Study*, *1*(3), 134–149. https://doi.org/10.36663/joes.v1i3.204.

Khunaifi, A. Y., & Matlani, M. (2019). Analisis Kritis Undang-Undang Sisdiknas Nomor 20 Tahun 2003. *Jurnal Ilmiah Iqra'*, *13*(2), 81. https://doi.org/10.30984/jii.v13i2.972.

Martín-Aragoneses, M. T., Expósito-Casas, E., López-Martín, E., & Nieto, D. A. (2021). Educator perceptions of the role of neuroscience in education: Evidence from Spain. *Bordon. Revista de Pedagogia*, *73*(3), 83–99. https://doi.org/10.13042/Bordon.2021.89143.

Morrar, R., Arman, H., & Mousa, S. (2017). The fourth industrial revolution (Industry 4.0): A social innovation perspective. *Technology Innovation Management Review*, *7*(11), 12–20. https://timreview.ca/sites/default/files/Issue_PDF/TIMReview_November2017.pdf#page=12.

Mulyati. (2022). Kurangnya Kompetensi Pendidik Menjadi Masalah di Indonesia. *Seri Publikasi Pembelajaran*, *1*(1), 47–58. http://publikasipips.ulm.ac.id/index.php/tmkm/article/view/429.

Nawaz, A., & Ghulam, M. K. (2010). Digital literacy: An analysis of the contemporary paradigms. *Department of Public Administration, Gomal University, Dera Ismail Khan, Khyber Pakhtoon Khwa, Pakistan*, *1*(2), 19–29. https://doi.org/10.5897/IJSTER.9000011.

Nurjanah, E., Rusmana, A., & Yanto, A. (2017). Hubungan literasi digital dengan kualitas penggunaan e-resources. *Lentera Pustaka: Jurnal Kajian Ilmu Perpustakaan Informasi Dan Kearsipan*, *3*(2), 117–140. http://download.garuda.kemdikbud.go.id/article.php?article=1067632&val=8293.

Putri, S. R., Usman, H., & Sakmal, J. (2022). Development Learning Media E-Book Based on TPACK on Natural Science Education in Elementary School. *Indonesia Journal of Learning Education and Counseling*, *5*(1), 30–34. https://doi.org/10.31960/ijolec.V5i1.1688.

Raysha, A. A., Shafira, N., & Rizky, A. (2020). The Development of Students' Worksheet Based on Inquiry Integrated by Youtube Video As The Alternative Of Teaching Materials During The Covid-19 Pandemic Period. *Pancaran Pendidikan*, *9*(2). https://doi.org/10.25037/pancaran.v9i2.294.

Saraswati, S., Linda, R., & Herdini, H. (2019). Development of Interactive E-Module Chemistry Magazine Based on Kvisoft Flipbook Maker for Thermochemistry Materials at Second Grade Senior High School. *Journal of Science Learning*, *3*(1), 1–6. https://doi.org/10.17509/jsl.v3i1.18166.

Setiawan, N. C. E., Dasna, I. W., & Muchson, M. (2020). Pengembangan Digital Flipbook untuk Menfasilitasi Kebutuhan Belajar Multiple Representation pada Materi Sel Volta. *Hydrogen: Jurnal Kependidikan Kimia*, *8*(2), 107. https://doi.org/10.33394/hjkk.v8i2.3194.

Stuchlikova, L. (2016). Challenges of Education in The 21st Century. *ICETA 2016 - 14th IEEE International Conference on Emerging ELearning Technologies and Applications, Proceedings*, 335–340. https://doi.org/10.1109/ICETA.2016.7802072.

Sugiyono. (2016). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Alfabeta.

Syafii. (2017). Pengembangan Bahan Ajar Ornamen Berbasis Candi di Jawa Tengah: Studi Identifikasi Candi Gedongsanga. *Jurnal Imajinasi*, *11*(2). https://doi.org/10.15294/imajinasi.v11i2.12813.

Taufan, M. Y. (2022). Professional Development of Teachers, Competencies, Educational Facilities and Infrastructure on Teacher Performance and Learning Achievement of High School Students in Makassar City. *Golden Ratio of Social Science and Education*, *2*(1), 24–38. https://doi.org/10.52970/grsse.v2i1.168.

Vastyanov, R., Yermuraki, P., Stoyanov, A., Tiron, O., Beseda, Y., Ostapenko, I., Dobrovolsky, V., Lapshin, D., & Stecenko, A. (2021). New aspects of pedagogical activity in the distant form of pathological physiology teaching to medical university students. *Journal of Education, Health and Sport*, *11*(10), 173–186. https://doi.org/10.12775/jehs.2021.11.10.015.

Wijayanti, D., & Pratomo, W. (2019). Pendidikan Karakter Melalui Model Pembelajaran Kreatif Bagi Siswa Sekolah Dasar (Studi Di Sdn Mendungan 2 Yogyakarta). *Taman Cendekia: Jurnal Pendidikan Ke-SD-An*, *3*(1), 276–282. https://doi.org/10.30738/tc.v3i1.4291.

Winatha, K. R., Naswan, S., & Ketut, A. (2018). Pengembangan E-modul Interaktif Berbasis Proyek Pada Mata Pelajaran Simulasi Digital Kelas X di SMK TI Bali Global Singaraja. *Jurnal Teknologi Pembelajaran Indonesia*, *8*(1). https://doi.org/10.23887/jtpi.v8i1.2238.

Yang, G., Badri, M., Al Rashedi, A., & Almazroui, K. (2018). The role of reading motivation, self-efficacy, and home influence in students' literacy achievement: a preliminary examination of fourth graders in Abu Dhabi. *Large-Scale Assessments in Education*, *6*(1), 4. https://doi.org/10.1186/s40536-018-0063-0.