Jurnal Edutech Undiksha
Volume 11, Number 1, Tahun 2023, pp. 195-202
P-ISSN: 2614-8609 E-ISSN: 2615-2908
Open Access: https://doi.org/10.23887/jeu.v11i1.58508

Problem-Based Learning Interactive Learning Multimedia to Improve Science Content Learning Competency

I Adrianus I Wayan Ilia Yuda Sukmana[1]* , Akmal[2] , I Kadek Suartama[3]

[1,2,3] Prodi Teknologi Pendidikan, Universitas Prndidikan Ganesha, Singaraja, Indonesia

ARTICLE INFO

Article history:
Received February 10, 2023
Accepted June 19, 2023
Available online June 25, 2023

Kata Kunci:
Multimedia Interaktif, Problem Based Learning, Kompetensi Pembelajaran

Keywords:
Interactive Multimedia, Problem-Based Learning, Learning Competency.

ABSTRAK

Kurangnya penggunaan media pembelajaran yang relevan dangan karakteristik siswa mengakibatkan rendahnya kualitas pembelajaran muatan IPA. Penelitian ini bertujuan untuk mengembangkan multimedia pembelajaran interaktif berbasis problem based learning untuk meningkatkan kompetensi siswa pada muatan IPA. Penelitian ini merupakan penelitian pengembangan dengan menggunakan model ADDIE. Subjek yang terlibat dalam penelitian ini yakni 1 ahli isi pembelajaran, 1 ahli desain pembelajaran, 1 ahli media pembelajaran, dan siswa kelas VI. Pengumpulan data dalam penelitian dilakukan dengan menggunakan metode kuisioner dan tes (pretest dan posttest). Data yang diperoleh dalam penelitian kemudian dianalisis dengan menggunakan teknik analisis deskriptif kualitatif, kuantitatif, dan statistik infrensial. Hasil penelitian menunjukan bahwa produk valid ditinjau dari aspek isi pembelajaran 97% (sangat baik); aspek desain pembelajaran 96% (sangat baik); aspek media pembelajaran 91% (sangat baik); aspek uji coba perorangan 96,66% (sangat baik); aspek uji coba kelompok kecil 94,77% (sangat baik); aspek uji coba lapangan 94,35% (sangat baik). Berdasarkan hasil efektivitas, multimedia interaktif berbasis problem based learning pada mata pelajaran muatan IPA menunjukan terdapat perbedaan yang signifikan hasil belajar siswa sebelum dan setelah menggunakan multimedia interaktif. Hal ini menunjukkan bahwa multimedia pembelajaran interaktif berbasis problem based learning pada mata pelajaran muatan IPA dinyatakan layak digunakan dalam proses pembelajaran.

ABSTRAK

The lack of instructional media relevant to student characteristics results in a low quality of science content learning. This study aims to develop problem-based learning interactive multimedia to improve students' competence in science content. This research is development research using the ADDIE model. The subjects involved in this study were one learning content expert, one instructional design expert, one instructional media expert, and sixth-grade students. Data collection in the study was carried out using questionnaires and tests (pretest and post-test). The data obtained in the study were then analyzed using descriptive qualitative, quantitative, and inferential statistical analysis techniques. The results showed that the product was valid in terms of the aspect of learning content 97% (very good); learning design aspect 96% (very good); learning media aspect 91% (very good); individual trial aspect 96.66% (very good); small group trial aspect 94.77% (very good); aspect of field trials 94.35% (very good). Based on the effectiveness results, interactive multimedia based on problem-based learning in science content subjects showed significant differences in student learning outcomes before and after using interactive multimedia. It shows that problem-based learning-based interactive multimedia in science content subjects are declared feasible for use in the learning process.

1. INTRODUCTION

Science is one of the compulsory subjects studied at the elementary school level (Aaliyah & Rahmat, 2021). Science learning is closely related to life, where we will learn about the natural surroundings and their constituent components (Kimianti & Prasetyo, 2019; Wulandari & Putra, 2021). In the learning process, learning materials are designed to develop students' knowledge, understanding, and analytical skills of the natural environment and its surroundings (Faizah et al., 2020; Putra, 2021). Some

*Corresponding author.
E-mail addresses: aiwiy-sukmana@undiksha.ac.id (Adrianus I Wayan Ilia Yuda Sukmana)

skills in science content learning content that students must master are demonstrating a scientific attitude, asking scientific questions, observing scientific objects using the five senses, and connecting scientific observations in simple language (Primasari et al., 2021; Widiastuti, 2021). To develop students' knowledge in science content lessons in elementary schools, of course, it must be adjusted to the level of child development. Elementary school (SD) children from 6 or 7 to 11 or 12 are included in the concrete operational phase category (Ningsih & Fitria, 2021; Nuryati & Yuniawati, 2019).

At this age, children's curiosity about their surroundings is quite high. So that during the learning process, students must be given experience and opportunities to develop their scientific attitudes and critical thinking skills toward nature and the surrounding environment (Laksmi & Suniasih, 2021; Sukarini & Manuaba, 2021; Wedyawati & Lisa, 2019). However, students' knowledge of science content lessons still needs to improve, causing student learning outcomes in science content lessons not to meet the specified Minimum Completeness Criteria (Dwiqi et al., 2020; Rahmi et al., 2019). It aligns with the observations made in the sixth grade of SD Negeri 1 Panji. The results of observations and interviews show that several problems make the science learning process less than optimal, such as teachers only relying on books and always using the lecture method during learning, lack of availability of interactive learning media that teachers use to increase student interest in learning, students are less active during the learning process. Teachers need to take advantage of the facilities offered by schools. The lack of teacher readiness and the lack of availability of science learning media then have an impact on low learning outcomes and student enthusiasm for learning. If left unchecked, these problems will certainly have an impact on students' knowledge competencies and have an impact on not achieving science learning goals in elementary schools. One of the efforts that can be made to overcome these problems is utilizing media in the learning process, as is the case with multimedia learning. Interactive multimedia combines and synergizes several combinations used to convey information, such as text, images, audio, video, and animation (Deliany et al., 2019; Dewantara et al., 2020; Firmadani, 2020). The application of interactive multimedia in the learning process can increase the knowledge and skills of students. This media invites students to play an active role in learning (Adi et al., 2021; Aprianty et al., 2021; Buchori, 2019). Besides that, interactive multimedia can also concretize various abstract concepts in learning material so that students can understand the material studied more easily (Dewantara et al., 2020; Tirtayani & Pratiwi, 2021). The application of interactive multimedia will be more effective if accompanied by the application of learning models. Learning models allow students to develop knowledge concepts (Astri et al., 2022).

The learning model that allows students to be active and involved in the science learning process is problem-based. Problem-based learning or problem-based learning is a learning model that presents the characteristics of real problems as a learning context for students to acquire critical thinking skills and problem-solving in order to gain new knowledge (Rati, 2022; Saragi et al., 2021; Wedayanti & Wiarta, 2022). Learning using the PBL model is carried out by presenting a problem to be analyzed by students so that this learning model focuses on student activity in the problem-solving process (Ridwan et al., 2023; Rohman et al., 2021). The implementation of learning by applying the PBL model is carried out in several stages of learning, including the orientation of students on problems, organizing students for learning, independent and group investigations, developing and presenting work, as well as analyzing and evaluating the process of solving problems (Margarita, 2018; Rahmadani & Taufina, 2020). Students can learn actively through these five steps to improve their learning outcomes and motivation. Several previous studies have revealed that applying the PBL model in the learning process can significantly improve social studies learning outcomes for students (Ariyani & Kristin, 2021). The results of further research reveal that the development of interactive multimedia based on educational games is very feasible to be developed and taught to students because it can improve science learning outcomes (Panjaitan et al., 2020). Other studies reveal that developing interactive learning media based on problem-based learning is effective and feasible for improving student learning outcomes (Endah, 2017; Karlina et al., 2019). Based on some of the results of these studies, interactive multimedia and the PBL model positively influence the learning process and student learning outcomes. In previous studies, no studies specifically discussed the development of problem-based learning interactive multimedia to improve competence in science content learning. So this research is focused on this study to increase student learning competence through the development of interactive multimedia based on problem-based learning in sixth-grade science content subjects.

2. METHOD

This research is a type of research and development (Research and Development) that was developed using the ADDIE development model. The ADDIE development model consists of five

development stages, including the analysis stage, the design stage, the development stage, the implementation stage, and the evaluation stage. The ADDIE model development procedure can be seen in the development stages, as presented in Figure 1.

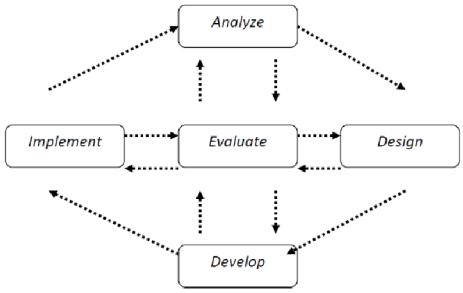

Figure 1 The Stages of the ADDIE Model Research

At the analysis stage, four things are analyzed: curriculum analysis, analysis of student characteristics and learning problems, competency analysis, and analysis of facilities supporting the learning process. Curriculum analysis is carried out to fix the characteristics and deficiencies contained in the curriculum. The curriculum applied to the sixth grade of SD Negeri 1 Panji is the 2013 curriculum, where learning is carried out thematically. Student characteristics and learning problems were analyzed through interviews with science content teachers and the distribution of needs questionnaires to students. It was done to discover teachers' and students' characteristics and problems in implementing the learning process. This analysis is needed to see whether the development of problem-based learning-based science content teaching materials needs to be done. Facility analysis is carried out to find out what facilities are in the school which can optimize the learning process. Competency analysis is carried out to determine basic competencies, indicators, and learning objectives that must be achieved in the learning process. The basic competencies and learning indicators used in the media development process can be seen in Table 1.

Table 1. Basic Competencies and Learning Indicators

Basic competencies		Indicator	
3.2	3.2 Describe the solar system. The sun is the center of the solar system, as well as the position and characteristics of the members of the solar system.	3.2.1	Mention the galaxy and the solar system.
		3.2.2	Describe the characteristics of the members of the solar system.

The second stage is the design stage (planning). The product design process is carried out at this stage by selecting and specifying software or devices used to develop interactive multimedia. The software used is Adobe Animate as the main software and Microsoft Powerpoint, Corel Draw, Canva, and other supporting applications. Then make flowcharts, storyboards, and assessment instruments and compile lesson plans. The third stage is development (development). Interactive learning multimedia is changed from storyboards and flowcharts into real products and is ready to be implemented in the learning process. The fourth stage is implementation (implementation). At this stage, the interactive learning multimedia that has been developed will be applied to the learning process. To measure the feasibility aspect of the media product being developed, as well as knowing student responses in terms of the attractiveness of the media product. The several stages of implementation that must be passed are the Product validation test by experts, including subject content experts, instructional design experts, and learning media experts; Product trials, including individual trials involving three students, small group trials involving nine students, and field trials involving all sixth graders of SD Negeri 1 Panji. Then the fifth stage is evaluation. The evaluation stage is the final stage of developing the ADDIE model. At this stage, multimedia products that have been developed will be assessed to validate the multimedia products that have been developed. The test carried out is a product validation test that aims to test the feasibility level of the product that has been developed. The evaluation used at this stage is formative. The formative evaluation aims to assess whether or not the interactive learning multimedia products that have been developed are applied in the learning process. This development research was carried out at SD Negeri 1 Panji for the 2022/2023 academic year. The product produced in this development research is learning media in the form of problem-based learning interactive multimedia used in science content subjects for sixth-grade elementary school students. The subjects of this development research consisted of 1 subject

matter expert, one instructional design expert, one instructional media expert, three students for individual trials, nine students for small group tests, and all sixth graders for field tests. Then effectiveness tests were also carried out with pretest and post-test on all SD Negeri 1 Panji sixth-grade students. The data collection method used a questionnaire and test method (pretest & post-test). The media validator assessment instrument grid is presented in Table 2.

Table 2. Media Validator Assessment Instrument

No.	Validator	Assessment Aspects	Item Number
1.	Learning Content Expert	1. Quality and depth of content material	1, 2, 3, 4, 5, 6 7, 8, 9
		2. Language	10, 11, 12, 13, 14, 15
		3. Adequacy of Presentation	
2.	Learning Design Expert	1. Learning design	1, 2, 3, 4
		2. Design learning strategies	5, 6, 7, 8, 9, 10, 11, 12, 13, 14
		3. Interactivity design	15, 16, 17, 18
3.	Media Expert	1. display	1, 2
		2. Typography	3, 4, 5, 6, 7, 8
		3. pictures/illustrations	9, 10, 11
		4. Accessibility	12, 13, 14, 15, 16

The data obtained in this study were then processed using qualitative, quantitative, and inferential statistical descriptive data analysis techniques. Qualitative descriptive data analysis was used to manage data based on suggestions and input. Quantitative descriptive data analysis is used to manage data through regular preparation in percentages or questionnaires, as presented in Table 3.

Table 3. Conversion of Achievement Level with a Scale of 5

Achievement Level (%)	Qualification	Information
90-100	Very good	No need to revise
75-89	Good	Little revision
65-74	Enough	Adequately revised
55-64	Not enough	Many things were revised
0-54	Very less	Repeated product creation

In this study, it was determined that the eligibility of the media was at least "good" as a result of assessments by learning content experts, learning design experts, learning media experts, educational technology experts, individual trials, small group trials, and field trials. If the final research results get a minimum rating of "good," then the resulting media product is considered suitable for learning.

3. RESULT AND DISCUSSION

Results

The feasibility of developing interactive learning multimedia products consists of the results of product validity carried out by experts and student trials. The results of data analysis in the development of interactive learning multimedia are in the form of review results from validity tests, subject content expert tests, instructional design expert tests, instructional media expert tests, individual trials, small group trials, and field trials. This validity test aims to determine the feasibility of the product developed before it is implemented in the learning process. The product validity test results are presented in detail in Table 4.

Table 4. Basic Competencies and Learning Indicators

No.	Trial Subjects	Validity Results (%)	Description
1.	Learning Content Expert Test	97%	Very good
2.	Learning Design Expert Test	96%	Very good
3.	Learning Media Expert Test	91%	Very good
4.	Individual Trial	96,66%	Very good
5.	Small Group Trial	94,77%	Very good
6.	Field trials Experts	94,35%	Very good

Based on the data in Table 4, overall, the results of the validity of problem-based learning-based interactive multimedia products obtained very good validity. Therefore, problem-based learning interactive multimedia is feasible and valid to use in the learning process in the classroom. Judging from the validation results of content aspects by learning content experts, problem-based learning interactive multimedia was developed to obtain a score of 97% with very good qualifications and is suitable for use. The display of learning media that has been developed can be seen in Figure 2.

Figure 2. Problem-Based Learning-Based Interactive Multimedia Development Results

The media that has been developed is then tested for its effectiveness through the experimental stage using a pretest and post-test on 40 sixth-grade students of SD Negeri 1 Panji. After manual calculations with the t-test, the pretest, and post-test results show that t_count=4.222 > t_table= 3.963. So there are significant differences in the learning outcomes of science content subjects before and after using interactive learning multimedia. The t-test analysis from the pretest and post-test data prove multimedia learning can improve student learning outcomes.

Discussion

Based on the data analysis that has been carried out, the results show that the media developed is in the valid category and is very feasible to be developed to improve students' natural science knowledge competencies. The success of media development is influenced by several factors, including first, from the aspect of the quality of learning content, interactive learning multimedia has been developed based on Competency Standards, Basic competencies, and learning indicators to ensure the relevance of the content of the material to the demands of learning in schools. A learning media must have a clear cycle of Competency Standards, Basic Competencies, and learning indicators (Astawa & Parmiti, 2017; Faizah et al., 2020). Compatibility of core competencies, Basic Competencies, and learning indicators in the learning process in schools as well as the demands of HOTS-based Abab-21 learning that focuses on critical thinking skills, cooperation, communication, and student creativity (Kimianti & Prasetyo, 2019; Wulandari & Putra, 2021). The use of a HOTS-based material presentation approach can educate students to think systematically, learn to analyze a problem from various aspects, educate students to be confident, and improve critical and creative thinking skills (Faizah et al., 2020; Ma'ruf et al., 2019; Putra, 2021).
Furthermore, the appropriateness of language use with students' characteristics can increase student interest and motivation to learn. Learning designs that are on the characteristics of learning and the characteristics of students will be more effective in facilitating students in the learning process to have a good impact on student learning outcomes (Supriatin et al., 2020). Then, the relationship between the presentation of the material and the daily life of students can make it easier for students to understand the learning material. The suitability of language use in teaching materials adapted to student characteristics will affect students' understanding of the material presented (Puspita et al., 2017; Rahmawati, 2019).
Second, from the quality aspect of the interactive learning multimedia learning design, this interactive learning is structured based on the stages of problem-based learning. Through problem-based learning, students will be required to think critically in identifying and solving problems, gathering much knowledge, and collaborating to design hypotheses based on the information students have collected. Here educators are only tutors and facilitators (Margarita, 2018; Rahmadani & Taufina, 2020; Sulastri & Pertiwi, 2020). Application of a problem-based learning-based learning system integrated into learning

activities through interactive multimedia adapted to students' conditions and the stages of problem-based learning (Ridwan et al., 2023; Rohman et al., 2021). Problem-based learning or problem-based learning is a learning model that presents the characteristics of real problems as a learning context for students to acquire critical thinking skills and problem-solving to gain new knowledge (Saragi et al., 2021). Learning using the PBL model is carried out by presenting a problem to be analyzed by students so that this learning model focuses on student activity in the problem-solving process (Rati, 2022; Saragi et al., 2021; Wedayanti & Wiarta, 2022).

Third, from an interactive design aspect, this multimedia is designed interactively using navigation hyperlink buttons on each page. There is also a website on the Let's Write page, which contains assignments to develop students' knowledge of the material they have learned (Dewantara et al., 2020; Tirtayani & Pratiwi, 2021). So that on this page, students are given the freedom to do the assignment. It can be done directly in their assignment book or accessed via the website listed (Deliany et al., 2019; Dewantara et al., 2020; Firmadani, 2020). An important aspect of interactive multimedia design includes understanding form and function and how the user experience impacts the effectiveness of the multimedia (Astri et al., 2022). In the implementation of learning, all information in the form of multimedia that combines text, images, videos, music, and interactivity can make the presentation of material more interesting (Tamara et al., 2019). Students at elementary school age are the age to see concrete operations, so the visual element is very important for students, so this must be ensured through an attractive cover form (Adi et al., 2021; Aprianty et al., 2021; Buchori, 2019). In the implementation of learning, all information in the form of learning multimedia that combines text, images, videos, music, and interactivity can make the presentation of material more interesting (Dwiqi et al., 2020). The results obtained in this study align with previous research results, which also revealed that applying the PBL model in the learning process can significantly improve social studies learning outcomes for students (Ariyani & Kristin, 2021). The results of further research reveal that the development of interactive multimedia based on educational games is very feasible to be developed and taught to students because it can improve science learning outcomes (Panjaitan et al., 2020). Other studies reveal that developing interactive learning media based on problem-based learning is effective and feasible for improving student learning outcomes (Endah, 2017; Karlina et al., 2019). Based on some of the results of these studies, it can be said that interactive multimedia based on the PBL model positively influences the learning process and student learning outcomes.

4. CONCLUSION

The development of interactive learning multimedia based on problem-based learning is classified as a very good qualification and declared feasible to be used in the learning process. Thus the resulting product can be presented as one of the appropriate learning media for improving student learning competence.

5. REFERENCES

Adi, E. P., Ulfa, S., & Pratama, N. K. P. (2021). Pengembangan Multimedia Interaktif Geografi Kelas X Materi Tata Surya. *Jurnal Kajian Teknologi Pendidikan*, *4*(2), 119–128. https://doi.org/10.17977/um038v4i22021p119.

Amaliyah, A., & Rahmat, A. (2021). Pengembangan Potensi Diri Peserta Didik Melalui Proses Pendidikan. *Attadib: Journal of Elementary Education*, *5*(1), 28. https://doi.org/10.32507/attadib.v5i1.926.

Aprianty, D., Somakim, S., & Wiyono, K. (2021). Pengembangan Multimedia Interaktif pada Pembelajaran Matematika Materi Persegi Panjang dan Segitiga di Sekolah Dasar. *Sekolah Dasar: Kajian Teori Dan Praktik Pendidikan*, *30*(1), 1. http://journal2.um.ac.id/index.php/sd/article/view/20176.

Ariyani, B., & Kristin, F. (2021). Model Pembelajaran Problem Based Learning untuk Meningkatkan Hasil Belajar IPS Siswa SD. *Jurnal Imiah Pendidikan Dan Pembelajaran*, *5*(3), 353. https://doi.org/10.23887/jipp.v5i3.36230.

Astawa, M. Y. B., & Parmiti, D. P. (2017). Pengembangan Multimedia Pembelajaran Ilmu Pengetahuan Alam Pada Siswa Kelas VIII Semester II Tahun Pelajaran 2014/2015 di SMP Negeri 2 Sawan Kecamatan Sawan Kabupaten Buleleng. *Jurnal Edutech Undiksha*, *5*(1), 51–61. https://doi.org/10.23887/jeu.v5i1.20202.

Astri, N. K. D., Wiarta, I. W., & Wulandari, I. G. A. A. (2022). Pengembangan Multimedia Interaktif Berbasis Pendekatan Kontekstual Pada Mata Pelajaran Matematika Pokok Bahasan Bangun Datar. *Jurnal Pendidikan Dan Konseling*, *4*(3), 575–585. https://journal.universitaspahlawan.ac.id/index.php/jpdk/article/view/4371.

Buchori, A. (2019). Pengembangan multimedia interaktif dengan pendekatan kontekstual untuk meningkatkan pemecahan masalah kemampuan matematika. *Jurnal Inovasi Teknologi Pendidikan*, *6*(1), 104–115. https://doi.org/10.21831/jitp.v6i1.20094.

Deliany, N., Hidayat, A., & Nurhayati, Y. (2019). Penerapan multimedia interaktif untuk meningkatkan pemahaman konsep IPA peserta didik di sekolah dasar. *Educare*, *17*(2), 90–97. https://doi.org/10.36555/educare.v17i2.247.

Dewantara, R. B., Suarsini, E., & Lestari, S. R. (2020). Analisis Kebutuhan Pengembangan Multimedia Interaktif Berbasis Problem Based Learning pada Materi Biologi SMA. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *5*(6), 749–753. http://journal.um.ac.id/index.php/jptpp/article/view/13163/6020.

Dewi, V. P., Doyan, A., & Soeprianto, H. (2017). Pengaruh Model Penemuan Terbimbing Terhadap Keterampilan Proses Sains Ditinjau Dari Sikap Ilmiah Pada Pembelajaran IPA. *Jurnal Penelitian Pendidikan IPA*, *3*(1). https://doi.org/10.29303/jppipa.v3i1.102.

Dwiqi, G. C. S., Sudatha, I. G. W., & Sukmana, A. I. W. I. Y. (2020). Pengembangan Multimedia Pembelajaran Interaktif Mata Pelajaran IPA Untuk Siswa SD Kelas V. *Jurnal Edutech Undiksha*, *8*(2), 33. https://doi.org/10.23887/jeu.v8i2.28934.

Endah, N. (2017). Peningkatan Hasil Belajar IPA Siswa Kelas 5 SD Menggunakan Model Pembelajaran Kooperatif Tipe TGT Berbantuan Media Gambar. *Jurnal Pendidikan Sekolah Dasar*, *3*(2), 96. https://doi.org/10.30870/jpsd.v3i2.2131.

Faizah, N. O., Wawan Sudatha, I. G., & Hamonangan Simamora, A. (2020). Pengembangan Multimedia Pembelajaran IPA Untuk Meningkatkan Hasil Belajar. *Journal of Education Technology*, *4*(1), 52. https://doi.org/10.23887/jet.v4i1.24091.

Firmadani, F. (2020). Media pembelajaran berbasis teknologi sebagai inovasi pembelajaran era revolusi industri 4.0. *KoPeN: Konferensi Pendidikan Nasional*, *2*(1), 93–97. https://ejurnal.mercubuana-yogya.ac.id/index.php/Prosiding_KoPeN/article/view/1084.

Ichsan, F. N., & Hadiyanto, H. (2021). Implementasi Perencanaan Pendidikan dalam Meningkatkan Karakter Bangsa melalui Penguatan Pelaksanaan Kurikulum. *Jurnal Studi Guru Dan Pembelajaran*, *4*(3), 541–551. https://doi.org/10.30605/jsgp.4.3.2021.1203.

Karlina, L., Suherman, S., & Sjaifuddin, S. (2019). Pengaruh Model Pembelajaran Berbasis Masalah Dan Aktivitas Belajar Terhadap Hasil Belajar IPA SD. *Jurnal Teknologi Pendidikan Dan Pembelajaran*, *6*(2), 106–117. https://jurnal.untirta.ac.id/index.php/JTPPm/article/view/7418.

Kimianti, F., & Prasetyo, Z. K. (2019). Pengembangan E-Modul IPA Berbasis Problem Based Learning Untuk Meningkatkan Literasi Sains Siswa. *Kwangsan: Jurnal Teknologi Pendidikan*, *7*(2), 91. https://doi.org/10.31800/jtp.kw.v7n2.p91--103.

Kusnandar, D. (2019). Pengaruh model problem based learning terhadap hasil belajar kognitif dan motivasi belajar IPA. *Madrascience: Jurnal Pendidikan Islam, Sains, Sosial, Dan Budaya*, *1*(1), 17–30. https://madrascience.com/index.php/ms/article/view/62.

Laksmi, N. L. P. A., & Suniasih, N. W. (2021). Pengembangan Media Pembelajaran E-Comic Berbasis Problem Based Learning Materi Siklus Air pada Muatan IPA. *Jurnal Imiah Pendidikan Dan Pembelajaran*, *5*(1), 56. https://doi.org/10.23887/jipp.v5i1.32911.

Ma'ruf, A. H., Syafii, M., & Kusuma, A. P. (2019). Pengaruh Model Pembelajaran Mind Mapping Berbasis HOTS terhadap Motivasi dan Hasil Belajar Siswa. *Mosharafa: Jurnal Pendidikan Matematika*, *8*(3), 503–514. https://doi.org/10.31980/mosharafa.v8i3.552.

Margarita, N. (2018). Pengembangan Multimedia Interaktif Sebagai Alat Bantu Pembelajaran Dengan Model PBL Untuk Peningkatan Hasil Belajar Matematika. *Journal for Lesson and Learning Studies*, *1*(3). https://doi.org/10.23887/jlls.v1i3.15388.

Ningsih, S. M., & Fitria, Y. (2021). Pengembangan Media Video Powtoon Berorientasi Model PBL Pada Pembelajaran IPA Untuk Siwa Kelas V SD. *Mendidik: Jurnal Kajian Pendidikan Dan Pengajaran*, *7*(2), 121–124. https://doi.org/10.30653/003.202172.175.

Nuryati, N., & Yuniawati, N. (2019). Peningkatan Kreativitas Pada Anak Usia Dini Kelas Sd Awal Usia 6-8 Tahun Melalui Metode Praktikum Membatik. *As-Sibyan: Jurnal Pendidikan Anak Usia Dini*, *4*(1), 1. https://doi.org/10.32678/as-sibyan.v4i1.1959.

Panjaitan, R. G. P., Titin, T., & Putri, N. N. (2020). Multimedia Interaktif Berbasis Game Edukasi sebagai Media Pembelajaran Materi Sistem Pernapasan di Kelas XI SMA. *Jurnal Pendidikan Sains Indonesia*, *8*(1), 141–151. https://doi.org/10.24815/jpsi.v8i1.16062.

Primasari, I. F. N. D., Marini, A., & Sumantri, M. S. (2021). Analisis Kebijakan Dan Pengelolaan Pendidikan Terkait Standar Penilaian Di Sekolah Dasar. *Jurnal Basicedu*, *5*(3), 1479–1491. https://doi.org/10.31004/basicedu.v5i3.956.

Puspita, A., Kurniawan, A. D., & Rahayu, H. M. (2017). Pengembangan media pembelajaran booklet pada

materi sistem imun terhadap hasil belajar siswa kelas XI SMAN 8 Pontianak. *Jurnal Bioeducation*, *4*(1). https://openjurnal.unmuhpnk.ac.id/bioed/article/view/524/0.

Putra, I. M. J. (2021). Pengembangan Multimedia Interaktif Berorientasi Pendekatan Kontekstual Materi Sumber Energi Pada Pembelajaran IPA Kelas IV SD. *Jurnal Edutech Undiksha*, *9*(1), 57–65. https://doi.org/10.23887/jeu.v9i1.32356.

Rahmadani, R., & Taufina, T. (2020). Pengembangan Multimedia Interaktif Berbasis Model Problem Based Learning (PBL) Bagi Siswa Sekolah Dasar. *Jurnal Basicedu*, *4*(4), 938–946. https://doi.org/10.31004/basicedu.v4i4.465.

Rahmawati, A. (2019). Penggunaan multimedia interaktif (MMI) sebagai media pembelajaran dalam meningkatkan prestasi belajar fisika. *PSEJ (Pancasakti Science Education Journal)*, *4*(1), 7–17. https://scienceedujournal.org/index.php/PSEJ/article/view/52.

Rahmi, M. S. M., Budiman, M. A., & Widyaningrum, A. (2019). Pengembangan Media Pembelajaran Interaktif Macromedia Flash 8 pada Pembelajaran Tematik Tema Pengalamanku. *International Journal of Elementary Education*, *3*(2), 178. https://doi.org/10.23887/ijee.v3i2.18524.

Rati. (2022). Pengembangan multimedia pembelajaran interaktif berbasis problem based learning (pbl) menggunakan aplikasi articulate storyline pada materi ikatan kimia 1,2,3. *Jurnal Pendidikan Dan Ilmu Kimia*, *6*(1), 70–79. https://ejournal.unib.ac.id/index.php/alotropjurnal/article/download/21799/10065.

Ridwan, M. F. A., Anjarini, T., & Ngazizah, N. (2023). Multimedia Interaktif Berbasis Problem Based Learning Pada Materi Ciri–Ciri Makhluk Hidup Bagi Siswa Sekolah Dasar. *Edukasiana: Jurnal Inovasi Pendidikan*, *2*(1), 56–63. https://doi.org/10.56916/ejip.v2i1.218.

Rohman, A. H., Kosim, K., Gunada, I. W., & Hikmawati, H. (2021). Pengembangan Multimedia Interaktif Berbasis PBL pada Materi Gerak Parabola untuk Meningkatkan Hasil Belajar Peserta Didik. *Kappa Journal*, *5*(2), 231–239. https://doi.org/10.29408/kpj.v5i2.4394.

Saragi, R., Tegeh, I. M., & Sukmana, A. I. W. I. Y. (2021). Media Pembelajaran Berbasis Problem Based Learnig menggunakan VideoScribe untuk Meningkatkan Hasil Belajar IPS Siswa Kelas V. *Jurnal Edutech Undiksha*, *10*(1). https://doi.org/10.23887/jeu.v10i1.41538.

Sukarini, K., & Manuaba, I. B. S. (2021). Pengembangan Video Animasi Pembelajaran Daring Pada Mata Pelajaran IPA Kelas VI Sekolah Dasar. *Jurnal Edutech Undiksha*, *9*(1), 48–56. https://doi.org/10.23887/jeu.v9i1.32347.

Sulastri, S., & Pertiwi, F. N. (2020). Problem-Based Learning Model Through Contextual Approach Related With Science Problem-Solving Ability Of Junior High School Students. *Insecta: Integrative Science Education and Teaching Activity Journal*, *1*(1), 50. https://doi.org/10.21154/insecta.v1i1.2059.

Supartayasa, G., Tegeh, I. M., & Suartama, I. K. (2017). Pengembangan Multimedia Interaktif Berbasis Masalah pada Mata Pelajaran IPA di SMP Negeri 3 Singaraja. *Jurnal Edutech Undiksha*, *5*(1), 100–110. https://doi.org/10.23887/jeu.v5i1.20629.

Supriatin, A., MS, Z., & Boeriswati, E. (2020). Efforts to Increase Creativity in Solving Mathematical Problems Through Scratch Media. *International Journal of Multicultural and Multireligious Understanding*, *7*(8), 318. https://doi.org/10.18415/ijmmu.v7i8.1879.

Tamara, M. F., Tulenan, V., & Paturusi, S. D. E. (2019). Aplikasi Pembelajaran Interaktif Sistem Pencernaan Manusia Untuk Siswa Sekolah Dasar. *Jurnal Teknik Informatika*, *14*(3), 377–386. https://doi.org/10.35793/jti.14.3.2019.27132.

Tirtayani, L. A., & Pratiwi, N. K. A. (2021). Multimedia Interaktif Sub Tema Profesi untuk Pembelajaran Anak Usia Dini. *Jurnal Pendidikan Anak Usia Dini Undiksha*, *9*(2), 186. https://doi.org/10.23887/paud.v9i2.35362.

Wedayanti, L. A., & Wiarta, I. W. (2022). Multimedia Interaktif Berbasis Problem Based Learning Pada Muatan Matematika Kelas IV SD. *Mimbar PGSD Undiksha*, *10*(1), 113–122. https://doi.org/10.23887/jjpgsd.v10i1.46320.

Widiastuti, N. L. G. K. (2021). E-Modul dengan Pendekatan Kontekstual pada Mata Pelajaran IPA. *Jurnal Imiah Pendidikan Dan Pembelajaran*, *5*(3), 435. https://doi.org/10.23887/jipp.v5i3.37974.

Wulandari, I. G. A. A., & Putra, W. B. (2021). Pengembangan Media Pembelajaran Sistem Pencernaan Manusia Berorientasi Teori Belajar Ausubel Kelas V Sekolah Dasar. *Mimbar Ilmu*, *26*(1), 174. https://doi.org/10.23887/mi.v26i1.31841.