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Interactive Multimedia Utilizing *Adobe Flash* for Elementary School Students' Fine Art

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Abstract

Interactive media is needed to help teachers so that learning can run optimally. This study aims to develop, evaluate the feasibility, and measure the effectiveness of interactive multimedia based on *Adobe Flash* in improving student learning outcomes in fine arts lessons on plastic waste craft materials. This study follows the *Borg and Gall* research model. The participants consisted of 20 fourth-grade students. Data collection methods include test techniques by conducting pretest and post-test assessments as well as non-test techniques in the form of observation, questionnaires, and interviews. The results of the study namely *Adobe Flash* Media was considered good by experts and was deemed suitable for use as a learning medium. The effectiveness of this media is shown by an increase in the average pretest and post-test score of 30.85 and the t-test results show a significance of < 0.05 with an n-gain of 0.7043 which is included in the high category. This media received a positive response from teachers and students. This media has proven to be effective, practical, and suitable for use to improve learning outcomes in the fine arts subject of plastic waste craft materials for grade IV of SDN 1 Trembulrejo.

Keywords: *learning* media; *learning outcomes*; *Adobe Flash*

INTRODUCTION

Education is crucial in developing standard and highly competitive talent management. Education can shape students who possess the potential to advance their skills in terms of attitude, understanding, and skills to become skilled, intelligent individuals with noble morals (Idammatussilmi et al., 2023). Through education, it can help improve people's welfare, preserve national culture, and build national civilization (Azis & Lubis, 2023). Education is a crucial factor in enhancing a nation's quality of life, so the government focuses on effective strategies to develop the education system in Indonesia (Anwar & Anis, 2020). The standard of human resources is an important aspect of the key factors that impact a country's development in acquiring knowledge and technology during the industrial revolution period 5.0 (Safira et al., 2024). During the industrial revolution period 5.0, academics is required to adapt and develop in utilizing technology to follow the era that is developing very rapidly. Improving human resources through education starting from elementary, secondary, and tertiary education is the key to adapting to the advancement of the Industry 5.0 era (Harahap & Siregar, 2020).

The development and advancement of technology have had a major influence on human civilization, particularly in the area of education. Society is now increasingly aware of the importance of technology in supporting the implementation of academic development in accordance with the age of globalization. Therefore, the improvement of innovative instruction

methods and education media must continue to be carried out because both are important aspects that need to be considered (Aziz, 2016; Media et al., 2024). Advances in science and technology present challenges to develop learning media that can more effectively enhance the quality of education (Astari et al., 2021; Maharani et al., 2023). With technological advancements, teachers are encouraged to enhance learning and find it easier to innovate in creating learning media using computers. Learning media that utilizes technology can motivate students and attract students' attention in participating in learning, especially digital media that combines various types of media commonly called multimedia (Kurniawan & da Ary, 2024; Maulidta & Sukartiningsih, 2018). It is not only about the multimedia concept but also about actively involving students in using the multimedia, allowing them to experience the full value of the media effectively. Therefore, multimedia must be based on digital interactivity where students are involved in operating actively and independently (Safira et al., 2024). With the advancement of technology, teachers can utilize various types of media that are appropriate to their needs and learning objectives. However, some teachers have not been making use of technology to the fullest extent in teaching and acquiring knowledge activities within the classroom setting. The ability of teachers to innovate using media that utilizes technology is one of the factors that causes students to lack understanding of lesson materials (Farida et al., 2021).

Based on the researcher's observations through observations and interviews conducted at SDN 1 Trembulrejo with teachers and students, the researcher identified various problems. One of them is the delivery of learning materials only using the lecture method, teachers still dominate the learning process, which leads to students being passive and learning becomes less meaningful and students' understanding of the material being taught is very minimal. Another problem is the lack of variation in learning resources and only using textbooks from the government in the form of textbooks for teachers and students. In addition, teachers only use blackboard media and makeshift tools. The utilization of digital media has not been available due to obstacles, namely that teachers have not fully mastered the creation of digital materials (Ariyanti & Ary, 2020). Although the school has access to a wireless fidelity network, it is not used optimally for classroom learning. According to the findings from the questionnaires that were distributed, 18 out of 20 fourth-grade students have cell phones that can access the internet and students can operate them well. Utilization of media using the help of technology can create more varied, interesting, and meaningful learning for students. The findings from the questionnaires distributed to fourth-grade students indicated that many of them still struggle to comprehend fine arts material due to monotonous learning activities and lack of interest in reading among students. Based on the problems above, one solution to improve student understanding is to use educational media (Nabilla et al., 2024). Educational media is highly beneficial for both educators and learners to overcome these problems. Educational media encompasses all that can be utilized to communicate material with the aim of enhancing student performance. With learning media, teachers can help convey material or messages from learning materials to students more easily (Syafa et al., 2021). Effective educational media is media that is capable of attracting students' attention, enhancing student engagement and aligns with their individual characteristics and learning styles while also meeting the desired educational objectives. Educational media can promote engagement between educators and students during the learning experience using various formats, including text, audio, images, and animation. In addition, multimedia-based learning is a method that utilizes computers and Android devices (Aprianti et al., 2023). Educational media is interactive media in the form of software. Multimedia causes it to be easy for students to obtain access to information on the

internet and get various learning experiences by providing interesting software. Interactive media combines text, images, sound, and animation to help students understand the concepts and principles taught, making learning more engaging and interactive. The interactive multimedia developed aims to train users in certain skills and strengthen mastery of concepts. The use of media can simplify the explanation of complex concepts, helping students understand them more easily and support the creation of effective communication between educators and students during the learning process (Rosa & Suastra, 2023). Educational tools is a type of multimedia that uses digital technology to convey information and allows interaction between learning materials and students (Wacanno et al., 2022). Users can control and operate the material according to the choices and instructions available. This media is vital to the learning process (Hasri et al., 2023). One type that can enhance students skills is interactive media developed with *adobe flash*. Incorporating learning media into the learning process emphasizes the crucial function of educators in creating these resources by leveraging information technology.

Adobe flash is a robust tool for producing animations that successfully illustrate educational content in an interesting and interactive way. *Adobe Flash* was originally developed for programming, even for those without a programming language background. *Adobe Flash* is a very popular animation software and is recognized for its sophistication, complete facilities and extraordinary capabilities in creating animations.this software is commonly utilized by animators. Its existence is very helpful and makes it easier for users to create animations (Sidik et al., 2020). One of the most interesting features is its ability to produce strong audiovisual content, which is not found in other programming languages. In line with this, previous research has shown that utilizing computer games as an educational resource can create a fun learning experience, focus on students, and increase student motivation and success (Maulidta & Sukartiningsih, 2018). The implementation of interactive multimedia in the classroom is highly suitable because it is able to present material more clearly. Creating a fun classroom atmosphere is an important task for an educator, who must find methods to tackle obstacles in the learning process. In addition, an educator has a great influence on improving student abilities. One option to consider is utilizing educational media in the form of interactive multiple forms of media that may make the education experience more meaningful (Oktafiani et al., 2020). Previous research shows that the use of interactive learning media in fine arts is very effective in improving students' skills. This media can encourage teachers to be more creative in delivering material through various computer programs to create teaching materials (Dewi & Kristiantari, 2022; Donna et al., 2021). Apart from that, learning with interactive multimedia can also strengthen understanding of concepts and motivate students to better understand the subject matter (Duwika & Paramasila, 2019; Mahendra, 2021). Therefore, researchers aim to raise the development of creative and innovative media that utilizes technological developments, namely interactive multimedia based on *Adobe Flash* for fine arts subjects, material on plastic waste crafts. This learning media is anticipated to enhance student learning outcomes (Satria et al., 2023).

METHOD

The research category methodology applied in this study is Research & Development. Research and development is a strategy utilized to create certain items and their performance (Maulidta & Sukartiningsih, 2018). The reason researchers use this type of research method is to develop learning media on the material of plastic waste craft arts. This study will produce *Adobe Flash*-based learning media with the aim of enhancing the educational results for fourth grade

learners of fine arts at SDN 1 Trembulrejo. The media development carried out by researchers refers to the procedure developed by (Sugiyono, 2019) there are 10 steps. However, due to limited time and costs, only eight steps are implemented, which are (1) recognizing opportunities and challengers; (2) gathering information; (3) creating the product; (4) confirming the design; (5) modifying the design; (6) carrying out product testing; (7) verifying the product; and (8) implementing the trial results.

The gathering data technique in this study used test and non-test types. The assessment type provides an assessment of making plastic waste crafts, while the non-test type uses the results of interviews, observations, surveys, and data presented as of documentation. To evaluate the practicality and suitability of the developed product, it will be determined depending on the assessment findings from the material and media validation process using a summated rating scale (Afifah Et Al., 2023; Lestari & Estiastuti, 2021). To find out the practicality of the product that has been developed, questionnaires were distributed to teachers and students after being given treatment using a likert scale. Then to analyze the data and find out the effectiveness of the product that has been developed is carried out in the form of a normality test, homogeneity, t-test,, and gain test on the pretest and post-test scores obtained by students.

RESULTS AND DISCUSSION

Results

The product created during the research is interactive multifaceted media created with *Adobe Flash*. The objective of this research is to create the media, evaluate its viability, and assess its effectiveness that has been developed for learning fine arts in grade IV Elementary Schools implementing the Borg and Gall development methodology. Based on the results of observation and interviews carried out several problems were found related to the implementation of learning, especially in the delivery of learning material where the teacher still dominates the learning process resulting in students becoming passive and a lack of variety in learning resources and media as well the use of media that has not used digital assistance in learning is lacking maximum. This shows that there is a lack of innovation in the media used each time learning.

The second stage is data collection. At this stage, questionnaires are distributed to teachers and students regarding the needs required within the learning process, relying on the data findings collection. It can be seen that the instructor’s guide and the learner’s book are considered less effective because they have to repeat the material that has been studied. Given the minimal media used, teachers need more innovative learning media innovations that follow the times. While students need teaching materials that do not only contain reading, but are equipped with more interesting colored images. Based on the collected data, it is essential to create learning tools that include engaging instructional media, following technological developments, containing images and videos but still paying attention to the scope of the material which can be employed by educators and all learners. Founded on this, the researcher developed interactive multimedia resources designed using *Adobe Flash*, enhanced with images, videos, and audio. The content of the material in the media is adjusted to learning achievements, learning objectives, the student's environment, and uses language that is appropriate to student development. The media concept designed by the researcher obtained approval from the class teacher and students.

The third stage is product design. In this stage, the researcher designs the creation of a media design based on *Adobe Flash*. The presentation of this learning media is designed in several pages with an aesthetic layout thus enabling it to attract the focus of students and increase their attraction in learning. The learning media page includes the main menu, instructions for using the media, learning achievements and objectives, learning materials in the format of text, images, and videos, and there are practice questions, developer profiles, and bibliographies. Interactive multimedia created with *Adobe Flash* is enhanced with features with various navigation buttons to simplify its use for learners, such as a button to start, a button to return to the menu, a button back to the previous page, and a button to go to the next page. The media created by the researcher is accessible utilizing computers and cellphones allowing kids to learn flexibly without restrictions on time and location. The content is available in APK and HTML formats and is integrated with a website through web hosting. The results of this improvement are shown in Figure 1.

Figure 1. Results of Interactive Media Development for Craft Art Material

The fourth phase is design validation.at this phase, the researcher performed a feasibility test by having the media evaluated by professional specialists in materials and media. The validation of the media and materials was conducted by lecturers from the elementary school teacher education program. The validation assessment used a summated rating scale and a notes column was added to provide input on the validated product, so that it can help researchers in revising the developed product. The validation assessment criteria indicate that a value between 81%-100% is considered very feasible, 61%-80% is feasible, 41%-60% is somewhat feasible, 21%-40% is not feasible and a value below 21% is deemed very not feasible. A summary of the product validation scores for both media and material auditors is provided in Table 3.

Table 3. Expert Auditor Assessment Result

Feasibility Aspect	Validation Index (%)	Description
Media expert	92%	Very feasible
Material expert	93%	Very feasible

Based on the auditor's assessment presented in table 3, it shows that the validation results given by the media auditor are 92%, which means they are categorized as very feasible because they are more than 81% and the validation results given by the material expert auditor are 93% which are also categorized as very feasible.

According to the assessments from the auditors shown in table 3, the media auditor rated the auditor result at 92%, classifying it as very feasible since it exceeds 81%. Similarly, the subject matter expert auditor provided a rating of 93%, which is also categorized as highly feasible. The average value obtained from the product validation results based on the data above is 92.5% with

a very feasible category. *Adobe Flash*-based it is declared that learning media is valid overall both in terms of appearance and content and is ready to be tested. This aligns with previous studies that demonstrate the outcomes of developing interactive media using *Adobe Flash* obtained high results with a very feasible category because they obtained a score above 81% (Insyani et al., 2023; M. R. Mahendra et al., 2021; Putra & Priyadi, 2024)

The fifth stage involves design revision. In this phase, the researcher updated the developed product based on the feedback given recommendations, suggestions, and feedback provided by the media and material expert auditors. The input was given by the media expert auditor regarding the use of font size and the use of navigation buttons. Meanwhile, the input given by the material expert auditor concerns the suitability of learning outcomes and learning objectives. The sixth step is the initial trial. In the first trial of the practicality of this media, was conducted with fourth-grade students comprising a total of 8 students with heterogeneous selection founded on the students' psychomotor levels consisting of 3 students who obtained high scores, 3 students who obtained medium scores, and 2 students with low scores. The pretest was administered prior to using the media for learning, while the post-test was conducted after the educational session with the media. The results of the students' pretest and post-test are presented in table 4.

Table 4. Pretest and Post-test Results

Test Type	Average	Average Difference
Pretest	56,35	30,85
Post-test	87,2	

According to table 4, there is a 30.85 increase in the average student scores learning outcomes. This data indicates a difference in student performance before and after the intervention using interactive media utilizing *Adobe Flash* for the subject of fine arts, material on plastic waste crafts. At this stage, a questionnaire was also given for teacher and student responses after students and teachers carried out learning using interactive multimedia based on *Adobe Flash*. Students and teachers received answer sheets with 18 questions using a summated rating scale, which they needed to complete based on their experiences with the *adobe flash* based media developed by the researcher. The evaluation criteria are outlined in Table 5.

Table 5. Summated Rating Scale Assessment Criteria

Eligibility Aspect	Validation Index (%)
81%-100%	Very Practical
61%-80%	Practical
41%-60%	Quite Practical
21%-40%	Not Practical
0%-20%	Very Not Practical

$$NP = \frac{R}{SM} X\ 100\%$$

To test the practicality of media from students and teachers on multimedia that is interactive and created using *Adobe Flash* a questionnaire which includes three factors affecting the quality of the media, the presentation of the content, and language of the material. The three aspects are further divided into eight indicators, which include media appearance, alignment of content related to learning outcomes, alignment of material with learning objectives, suitability with student thinking levels, completeness of material, suitability of text, images, videos, and colors, instructions for using media, and use of language used in the product developed. The responses from educators and learners are shown in table 6.

Table 6. Results of teacher and student

Respondents	Respondents Percentage (%)	Description
Teacher	100%	Very Practical
Student	96,2%	Very Practical

Table 6 indicates that the responses from teachers and students regarding the *Adobe Flash*-based interactive media are very practical, receiving a score above 81%. Therefore, it can be inferred that the developed media is effective for use during the trial stage. This aligns with previous research, which reported that teacher and student response questionnaires scored 81%, demonstrating that the media created by the researchers can be effectively utilized in learning activities (Anita Adesti & Siti Nurkholimah, 2020; Taher & Bentri, 2024).

The seventh stage is product revision. This revision was carried out after identifying deficiencies in interactive multimedia based on *Adobe Flash* that were revealed after the initial trial. Revisions were made based on suggestions, input, and comments from teachers involved in the initial trial related to audio that was partly not loud enough. The eighth stage is trial use. At this stage a trial was conducted with fourth-grade students to evaluate the use of *Adobe Flash* interactive media in fine arts education, specifically on the topic of plastic waste crafts. The trial phase intends to evaluate the viability and effectiveness of the product by analyzing students' learning outcomes. The research adopts a pre-experimental design, using a one-group pre-test and post-test model. This design uses steps in the form of giving a pretest before being given treatment and a post-test after being given treatment. Data analysis was performed using the t-test and n-gain to assess changes in student learning outcomes. Before the main analysis, a normality test is conducted to determine if the data follows a normal distribution. The results of the normality test are shown in table 7.

Table 7. Normality Test

	Table	**Kolmogorov-Smirnov**			**Shapiro-Wilk**		
		Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Learning outcomes	Pretest	0.160	20	0.196	0.929	20	0.145
	Post-test	0.177	20	0.099	0.932	20	0.172

*. This is a lower bound of the true significance
a. Lillierors Significance Correction

According to the analysis in table 7, the data follows a normal distribution because the significance value exceeds 0.05. Subsequently, a homogeneity test was conducted to assess the

uniformity of the variance between pre-test and post-test values. The decision is based on the significance value, if it is greater than 0.05, the data is considered homogeneous, while if it is less than 0.05, the data is not homogeneous (Haryono, E., Slamet, M., & Septian, 2023). The homogeneity test results are displayed in table 8.

Table 8. Homogeneity Test Results

		Levene Statistic	df1	df2	Sig.
Learning outcomes	Based on Mean	2.222	1	38	0.144
	Based on Median	2.229	1	38	0.144
	Based on Median with adjusted df	2.229	1	34.743	0.144
	Based on trimmed mean	2.255	1	38	0.441

According to the table above, the significance value is 0.1444, which exceeds 0.05, indicating that the variance between pretest and post-test values is homogeneous. After confirming data homogeneity, a t-test was conducted. The t-test results are presented in table 9.

Table 9. T-Test Results

		Paired Differences					f	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval				
					Lower	Upper			
Pair 1	Pretest Post-test	-29.100	4.733	1.058	-31.315	-26.884	27.490	19	<0.001

According to table 9, a significant difference exists between the pretest and post-test result learning outcomes, as the significance value is below 0.05, indicating that the developed is effective for use. To further determine the increase in students' average scores, an N-gain index analysis is conducted based on the pretest and post-test results. The N-gain test results are provided in table 10.

Table 10. N-gain Test Results

	N	Minimum	Maksimum	Mean	Std. Deviation
Ngain	20	0.55	00.83	0.7043	0.08199
Valid N (listwise)	20				

Table 10 shows that the average value increase is 0.7043, indicating that the N-gain value is greater than 0.7, which is classified in the high category. This increase suggests that interactive media based on *Adobe Flash* has a considerable effect on learning activities, enhancing student learning outcomes. This finding is consistent with earlier studies that have demonstrated the effective use of learning media in improving student educational achievements (Astari et al., 2021; M. R. Mahendra et al., 2021; Mawardani et al., 2023).

Discussion

Adobe flash based interactive multimedia is developed in an interesting, fun, and tailored to student needs. Interesting media can help concentration and increase students' learning motivation so that when the teacher delivers material in class, students' attention to lessons can increase. This multimedia was developed in several pages which include the main menu, instructions for use, achievements and objectives learning, learning materials, and equipped with practice questions to improve understanding of the material. The presentation of learning material is packaged attractively in the form of text, images, audio, and video so students not only see and read but can listen and watch. *Adobe Flash*-based interactive multimedia is equipped with various buttons for navigation to make it easier for students to operate it, such as a button to start, a button to return to the menu, a button to return to the previous page, and a button to go to the next page. With these navigation buttons, the interaction between students with learning media can take place where students provide actions such as pressing a button or entering an answer, while the learning media provides a reaction by carrying out instructions according to students' orders and providing corrections to answers given by students. The media developed can be accessed using smartphones and computers, making it easier for students to learn flexibly without being bound by time and place.

Based on assessments from media expert validators and material, multimedia expert validators the *Adobe Flash*-based interactive that was developed received validation results with an average value of 92,5% were categorized as very feasible. *Adobe Flash*-based learning media is stated valid as a whole both in terms of appearance and content. The study results indicate that the *Adobe Flash*-based interactive multimedia developed by the researchers has excellent qualifications, making it suitable for use in teaching plastic waste crafts in fine arts subjects. Based on the result of product trials, research into multimedia development based on *Adobe Flash* has several advantages. First, the interactive multimedia developed using *Adobe Flash* is effective in enhancing students' learning outcomes. Its use significantly enhances the learning process's effectiveness in delivering content, making it simplify the material for students to comprehend, as evidenced by the difference in student learning outcomes. This is demonstrated by the improvement in the average scores from the pretest to the post-test, with an improvement of 30.85, from an average pretest score of 56.35 to an average post-test score of 87.2.

Second, the application of media in learning craft material can enhance students' motivation to learn. This media helps students so that they do not get bored quickly, which often happens in a monotonous and boring learning process (Wulandari et al., 2020). This study aligns with other research indicating that the utilization of *Adobe Flash*-based interactive media can enhance students' motivation and interest in learning (Sepsa & Mulyani, 2023). Improving student learning outcomes can be achieved through various approaches such as the use of teaching aids, media, and learning models that are adjusted to class conditions and student characteristics.

Third, the utilization of *Adobe Flash*-based multimedia in the education process may create learning experiences and encourage active participation of students, so that they can establish effective communication between students and teachers. Effective learning media is media that can actively involve students and establish good communication between students and teachers. Educational media serves a crucial function in the educational process because it accelerates understanding and makes it easier for students to create a more enjoyable learning experience for

them (Herma, 2021). Interactive multimedia created by researchers with *Adobe Flash* provides a captivating and enjoyable educational experience for students. This approach allows learners to actively use the media and explore materials by navigating the selection buttons, which enhances their participation during the educational process. This aligns with the specifications of interactive multimedia, namely (a) combining more than one element with the same purpose as audio and visuals to convey learning information; (b) interactive, which enables students to participate in the learning process by providing them the freedom to choose material categories; and (c) independent, where students can use the media completely without the need for guidance from others (Oktafiani et al., 2020). This aligns with earlier research indicating that interactive multimedia developed using *Adobe Flash* can enhance students' skills and boost their engagement in the educational process (Maharani et al., 2023; Rostyawati et al., 2021). Additionally, earlier research has noted that this type of media can improve students' motivation to learn (Azriati et al., 2020). The implementation of interactive multimedia that employs *Adobe Flash* can be beneficial for students in helping students to understand the material received, increase interest in learning, increase learning motivation, involve students actively, and provide experiences for students so that learning is more interesting. According to this study, it can be stated that the interactive media based on *Adobe Flash* that was developed is considered appropriate for application in learning to enhance student performance.

In addition to having advantages, the multimedia developed also has several disadvantages, namely the need for an internet connection to access the media and the limitations of electronic devices such as laptops and smartphones owned by students. Some students still have to borrow their parents' smartphones, so accessibility is limited.

CONCLUSION

Conclusion

According to the conducted research, it can be regarded as concluded that the production of educational media in the form of interactive multimedia using *Adobe Flash* can enhance students' academic performance in the fine arts topic, particularly in the area of plastic waste crafts. *Adobe Flash*-based interactive multimedia is developed in the form of media equipped with navigation buttons and there is material containing text, image, video, and audio that can be accessed via smartphone and computer device. It can be interesting and easily accessible to students. This is supported by the pretest and final assessment analysis, which showed an average enhancement of 30.85, along with an N-gain of 0.704, showing high effectiveness. Additionally, expert auditors assessed the product's feasibility and validation, resulting in an average score of 92.5%, classifying it as very feasible. Furthermore, feedback from teacher and student response questionnaires indicated a very positive reception of the developed media. Therefore, the data suggests that interactive multimedia utilizing *Adobe Flash* is both effective and suitable for use during the educational process to enhance student learning outcomes.

Suggestion

Based on *Adobe Flash* multimedia acquisition of knowledge products may be an innovation to support students in the process of learning fine arts that are interesting, easy to understand, and actively involve students. It is necessary to develop this *Adobe Flash*-based multimedia learning using other materials, because this study is only limited to the material of plastic waste craft art.

Furthermore, it is necessary to take into account the conditions of teachers and students and the availability of the required facilities.

REFERENCES

Afifah, D. S. N., Nafi'an, M. I., & Manggar, D. A. (2023). The Development of Adobe Flash CS6-Based Interactive Media to Improve Numerical Literacy Skills for Madrasah Ibtidaiyah Students. *Jurnal Matematika Kreatif-Inovatif*, *14*(1), 75–85. https://journal.unnes.ac.id/nju/index.php/kreano/article/view/38825

Anita Adesti, & Siti Nurkholimah. (2020). Pengembangan Media Pembelajaran Berbasis Android Menggunakan Aplikasi Adobe Flash Cs 6 Pada Mata Pelajaran Sosiologi. *Edutainment : Jurnal Ilmu Pendidikan Dan Kependidikan*, *8*(1), 27–38. https://doi.org/10.35438/e.v8i1.221

Anwar, S., & Anis, M. B. (2020). Pengembangan Media Pembelajaran Matematika Berbasis Adobe Flash Profesional pada Materi Sifat-Sifat Bangun Ruang. *Jurnal Pendidikan Matematika (Kudus)*, *3*(1), 99. https://doi.org/10.21043/jpm.v3i1.6940

Aprianti, R., Rakhmat, C., Indihadi, D., & Indonesia, U. P. (2023). *Pengaruh Penggunaan Video Animasi Terhadap Minat Belajar Siswa Pada Tema Organ Gerakan Hewan Di Kelas V Sekolah Dasar*. *6*(2), 398–407. https://doi.org/10.31949/jee.v6i2.5315

Ariyanti, S. E., & Ary, D. (2020). Media Kartu Kuartet Dikda Seni Tari Berbasis *Outdoor Learning*. *Joyful Learning Journal*. *9*(2), 72–77. https://10.15294/jlj.v9i2.39356

Astari, W., Suyanti, R. D., & Saragi, D. (2021). Effect of Collaborative Based Inquiry Learning Model Using Macromedia Flash and Motivation on Science Learning Outcomes of 5th Grade Students of Elementary School Angkasa 2 Lanud Soewondo Medan. *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal*, *4*(1), 193–202. https://doi.org/10.33258/birle.v4i1.1573

Azis, A. C. K., & Lubis, S. K. (2023). Pembelajaran Seni Rupa Berdasarkan Perspektif Kurikulum Merdeka Di Sekolah Dasar. *Pena Anda: Jurnal Pendidikan Sekolah Dasar*, *1*(1), 10–19. https://doi.org/10.33830/penaanda.v1i1.4948

Aziz, A. (2016). Pengembangan Media Pembelajaran Batik Tulis Berbasis Multimedia Interaktif Menggunakan *Adobe Flash* Cs3 Pada Mata Pelajaran Seni Budaya Kelas VII Di MTS Negeri Godean Artikel *E-Journal* Diajukan Kepada Fakultas Bahasa dan Seni Universitas Negeri Yogyakarta. *Jurnal Pendidikan Kriya*, *5*, 1–7. http://eprints.uny.ac.id/id/eprint/40859

Azriati, S. A., Syahputra, E., Utara, S., Estate, M., & Utara, S. (2020). Macromedia Flash Based Learning Media Development to Improve Spatial Student Ability. *Journal of Education and Practice*, *11*(3), 118–125. https://doi.org/10.7176/jep/11-3-14

Dewi, N. K. A. A., & Kristiantari, M. G. R. (2022). Multimedia Interaktif Ceria pada Tema Peduli Terhadap Makhluk Hidup Kelas IV SD. *Jurnal Penelitian Dan Pengembangan Pendidikan*, *6*(1), 72–80. https://doi.org/10.23887/jppp.v6i1.46150

Donna, R., Egok, A. S., & Febriandi, R. (2021). Pengembangan Multimedia Interaktif Berbasis Powtoon pada Pembelajaran Tematik di Sekolah Dasar. *Jurnal Basicedu*, *5*(5), 3799–3813. https://doi.org/10.31004/basicedu.v5i5.1382

Duwika, K., & Paramasila, K. W. (2019). Pengembangan Multimedia Interaktif Model Hybrid Bernuansa Karakter Bali "Cupak-Gerantang" Pada Pembelajaran Teknik Animasi 2 Dimensi. *Journal of Education Technology*, *3*(4), 301. https://doi.org/10.23887/jet.v3i4.22501

Farida, F., Hanum, F., & Rahim, A. (2021). Adobe Flash CS6 to Develop Mathematics Learning Media for Plane Geometry. *Jurnal Didaktik Matematika*, *8*(2), 175–189. https://doi.org/10.24815/jdm.v8i2.21341

Harahap, L. K., & Siregar, A. D. (2020). Pengembangan Media Pembelajaran Interaktif Berbasis Adobe Flash Cs6 Untuk Meningkatkan Motivasi Dan Hasil Belajar Pada Materi Kesetimbangan Kimia. *JPPS (Jurnal Penelitian Pendidikan Sains)*, *10*(1), 1910. https://doi.org/10.26740/jpps.v10n1.p1910-1924

Haryono, E., Slamet, M., & Septian, D. (2023). *Statistika SPSS 28*. Widya Bhakti Persada.

Hasri, S. A., Fitria, Y., & Erita, Y. (2023). Interactive Multimedia Based on Adobe Flash Software on Thematic Learning for Grade V Elementary School. *Indonesian Journal of Educational Research and Review*, *6*(2), 396–409. https://doi.org/10.23887/ijerr.v6i2.66087

Herma, S. M. (2021). Pengembangan Media Pembelajaran Interaktif Berbantuan Adobe Flash Cs6 Pada Kelas Iv Mi Nw Sukamulia. *3*(2), 99–112. https://doi.org/10.30762/factor-m.v3i2.3092

Idammatussilmi, Ellianawati, & Nur Wahyudi. (2023). Jejeran: Interactive Game-Based Flash Media as Social Studies Learning Media in Elementary Schools. *Jurnal Ilmiah Sekolah Dasar*, *7*(2), 351–362. https://doi.org/10.23887/jisd.v7i2.53705

Insyani, S., Syahputra, E., & Mulyono, M. (2023). *Development of Adobe Flash-Based Learning Media Based on Cooperative Learning to Improve Spatial Ability and Student Learning Independence Public Elementary School 066650 Medan*. https://doi.org/10.4108/eai.1-11-2022.2326168

Kurniawan, R., & da Ary, D. (2024). Lirmasetad Learning Media (Linktree Regional Dance Arts Materials) In Primary School Sbdp Lesson Content. *Journal of Education, Teaching, and Learning*, *9*(1), 60–65. https:// 10.26737/jetl.v9i1.4894

Lestari, R. M., & Estiastuti, A. (2021). Adobe Flash-Based Interactive Media Development on Social Studies Learning Outcomes Class IV. *Elementary School Teacher*, *5*(2), 1–5. https://journal.unnes.ac.id/nju/index.php/est/article/view/33826

Maharani, R. A., Erita, Y., Darmansyah, D., & Sukma, E. (2023). Development of Learning Media Assisted Adobeflash CS7 by Using the Demonstration Method in Science Learning. *Jurnal Penelitian Pendidikan IPA*, *9*(7), 5376–5382. https://doi.org/10.29303/jppipa.v9i7.4535

Mahendra. (2021). Pembuatan Video Pembelajaran Interaktif Siswa Berbasis "CINTA" Melalui SFH untuk Meningkatkan Motivasi dan Hasil Belajar Biologi. *Indonesian Journal of Educational Development*, *2*(2), 290–301. https://doi.org/10.5281/zenodo.5244537

Mahendra, M. R., Supriansyah, & Zulherman. (2021). Development of Macromedia Flash-Based Mathematics Learning for Elementary School Students. *Journal of Physics: Conference Series*, *1783*(1). https://doi.org/10.1088/1742-6596/1783/1/012006

Maulidta, H., & Sukartiningsih, W. (2018). Pengembangan Media Pembelajaran Interaktif Berbasis Adobe Flash Untuk Pembelajaran Menulis Teks Eksposisi Siswa Kelas III SD. *Jpgsd*, *06*(05), 681–692.

Mawardani, A., Mirunalini, M., Meechi, C., & Shah, S. (2023). Development of Interactive Multimedia Based on Adobe Flash as a Learning Media Steps of Geographical Research. *Journal of Educational Technology and Learning Creativity*, *1*(1), 16–24. https://doi.org/10.37251/jetlc.v1i1.620

Purwatiningsih. (2024). *Development Of Learning Media Based On Macromedia Flash To Improve The Learning Outcomes Of IPAS Subjects Of Class IV Students Fatahillah Min 2*

Jember. *1*(2), 45–50. https://doi.org/10.59923/mechatronics.v1i2.154

Nabilla, F., Putri, M., & Ary, D. (2024). *Popoin Media Based on Interactive Powerpoint for Primary Students ' Dance Arts Education Practice*. *8*(2), 276–285. https://doi.org/10.23887/jere.v8i2.76420

Oktafiani, D., Nulhakim, L., & Alamsyah, T. P. (2020). Pengembangan Media Pembelajaran IPA Berbasis Multimedia Interaktif Menggunakan Adobe Flash pada Kelas IV. *MIMBAR PGSD Undiksha*, *8*(3), 527–540. https://doi.org/10.23887/jjpgsd.v8i3.29261

Putra, N. D., & Priyadi, A. (2024). *Flash-Based Flash-Based Mathematics Learning Media Case Study At Randugunting State Primary School Semarang District*. *International Journal of Graphic Design 1*(2).

Rosa, D., & Suastra, I. W. (2023). *Media Pembelajaran Interaktif untuk Meningkatkan Keterampilan Membaca Permulaan pada Mata Pelajaran Bahasa Indonesia untuk Siswa Kelas I Sekolah Dasar*. *7*(3), 443–450. https://doi.org/10.23887/jipp.v7i3.60119

Rostyawati, R., Zulherman, & Bandarsyah, D. (2021). Analytical Effectiveness using Adobe Flash in Learning Energy Source at Primary School. *Journal of Physics: Conference Series*, *1783*(1). https://doi.org/10.1088/1742-6596/1783/1/012125

Safira, R. F., Nahdi, D. (2024). *Keragaman Perangkat Lunak Multimedia Interaktif*. *5*(2), 68–77. https://doi.org/10.31949/madinasika.v5i2.7812

Satria, A., Widjanarko, D., & Anis, S. (2023). Pengembangan Media Pembelajaran Adobe Flash Berbasis Android Untuk Meningkatkan Hasil Belajar Siswa Dalam Kompetensi Anti Lock Brake System. *Jurnal Pendidikan Karir Vokasi*, *8*(1), 1–8. https://journal.unnes.ac.id/nju/index.php/jvce

Sepsa, R., & Mulyani, E. A. (2023). Development of Macromedia Flash Media Based on Riau Malay Culture in BMR Subject For Class IV Elementary School Students. *Education Technology Journal*, *2*(1), 44–53. https://doi.org/10.56787/edutech.v2i1.20

Sidik, G. T., Kelana, J. B., Altaftazani, D. H., & Firdaus, A. R. (2020). the Effect of Macromedia Flash Based Learning Media To Improve the Ability To Calculate of Students in Elementary School. *PrimaryEdu - Journal of Primary Education*, *4*(2), 241. https://doi.org/10.22460/pej.v4i2.1805

Sugiyono. (2019). *Metode Penelitian & Pengembangan Research and Development*. Alfabeta.

Syafa, D. A., Pujiastuti, P., & Anggraini, D. (2021). Development of Adobe Flash Media in Increasing Learning Interest. *AL-ISHLAH: Jurnal Pendidikan*, *13*(2), 1239–1246. https://doi.org/10.35445/alishlah.v13i2.675

Taher, R., & Bentri, A. (2024). Development of Interactive Media Using Macromedia Flash 8 Software in Natural Sciences Subjects in Elementary Schools. *AL-ISHLAH: Jurnal Pendidikan, 16*(2), 2339–2349. https://doi.org/10.35445/alishlah.v16i2.4786

Wacanno, O. A., Kuswara, H., Mukhayaroh, A., Informasi, S., & Mandiri, N. (2022). Multimedia Pembelajaran Menggunakan Adobe Flash Sebagai Game Edukasi Dalam Pengenalan Mata Uang Rupiah Pada Siswa Kelas Satu Sekolah Dasar. *Indonesian Journal on Networking and Security*, *11*(3), 168–175.

Wulandari, D., Hartati, S., Ary, D. Da, & Prasetyaningtyas, F. D. (2020). Interactive media development of natural sciences' component to foster the inspirational characters of pste students. *International Journal of Scientific and Technology Research*, *9*(3), 1351–1354.