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Development of a Google Sites-Based Photography Portfolio Information System to Improve Vocational High School Students' Skills and Creativity

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Abstract

Photography learning in vocational high schools (SMK) with Visual Communication Design (DKV) expertise requires mastery of technical skills and visual creativity supported by a structured portfolio system. However, the management of students' photographic works is still not systematic and not integrated with learning, resulting in low motivation, limited collaboration, and minimal feedback. This study aims to develop a Google Sites-based Photography Portfolio Information System (SiPoKaF) and test its feasibility and effectiveness in improving vocational high school students' photography skills and creativity. The study used the Research and Development (R&D) method with the ADDIE model. The research subjects involved 70 grade XI DKV students of SMK Negeri 1 Pringapus who were divided into experimental and control classes. The research instruments included a media and material expert validation questionnaire, an effectiveness questionnaire, and a photography skill and creativity test through a pretest and posttest. Data analysis was carried out using normality tests, homogeneity tests, N-Gain calculations, and independent sample t-tests. The results showed that SiPoKaF was very feasible to use with a media expert score of 4.75 and a material expert score of 4.4. The effectiveness test showed that the N-Gain value of the experimental class was 83.28%, higher than the control class, and the t-test showed a significant difference in learning outcomes after the treatment. This proves that SiPoKaF is effective in improving the photography skills and creativity of vocational high school students.

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INTRODUCTION

The development of digital technology has brought significant changes to the world of education, particularly in vocational education, which focuses on skills acquisition and job readiness. The integration of information technology into learning serves not only as a medium for delivering material but also as a means of managing the learning process, documenting student work, and evaluating student competency achievement. Numerous studies have shown that the use of digital technology in vocational education can significantly improve learning effectiveness, practical skills, and student creativity (Fukuda, 2020; Purwanto et al., 2021).

Vocational High Schools (SMK) play a strategic role in preparing graduates who are adaptable to developments in the creative industry. In the Visual Communication Design (DKV) Expertise Program, photography is a core competency that demands mastery of both technical aspects and visual creativity. Photography learning should ideally focus not only on the final product but also on the learning process and continuous development of student competencies. Research by Nugroho et al. (2024) and Derrydamawati et al. (2022) confirms that project-based photography learning and digital practice can improve the technical skills and aesthetic quality of vocational high school students' work.

Digital portfolios are seen as a form of authentic assessment relevant to the characteristics of vocational learning. Portfolios serve not only as archives of work but also as a medium for reflection, evaluation, and presentation of student competency achievements. Zubizarreta (2020) stated that digital portfolios encourage students to continuously reflect on their learning process, thus positively impacting conceptual understanding and practical skills. Furthermore, digital portfolios also play a crucial role in building professional identity and preparing students to enter the creative workforce (Bhatnagar & Mehta, 2021).

However, the results of initial observations on photography learning at SMK Negeri 1 Pringapus, especially in class XI of the Visual Communication Design Expertise Program, show that documentation of students' photographic work has not been managed systematically. Most students still store their work on personal devices without a clear structure, so that the work is easily lost and difficult to use as learning evaluation material. This condition is in line with the findings of Kerimbayev et al. (2023) and Daodu et al. (2024) who emphasized that student-centered learning *requires* the support of a structured, integrated, and reflection-oriented technology system and learning evaluation to encourage active involvement and the development of student creativity.

Utilizing collaborative web-based platforms is an alternative solution to address these issues. Google Sites is a relatively easy-to-use, free, and integrated web-based platform with Google Workspace. This platform enables visual presentation of work, systematic data storage, and online feedback. Several studies have shown that Google Sites is effective as a learning tool and digital portfolio because it supports project-based learning, collaboration, and student reflection (Rikani et al., 2021; Nugroho et al., 2023).

In line with the demands of education in the Society 5.0 era, the use of digital technology in learning is expected to not only increase efficiency but also strengthen students' roles as creative subjects. Vocational education is required to integrate technical skills, creativity, and reflective abilities in an integrated manner (Fukuda, 2020). In the context of photography learning, a web-based digital portfolio system has been shown to improve the quality of work and students' confidence in presenting their work to the public (Nabilah et al., 2025).

Based on empirical conditions at SMK Negeri 1 Pringapus and the support of theoretical studies and previous research, it is necessary to develop learning media that are able to address the problems of work documentation, learning evaluation, and the development of student photography creativity. Therefore, this research focuses on the development of a Google Sites-based Photography Portfolio Information System (SiPoKaF) as an effort to improve the photography skills and creativity of vocational school students. The results of the study indicate

that the effectiveness of using SiPoKaF in the learning process reaches 98% with a very effective category. Thus, the development of SiPoKaF is expected to be a medium for learning, reflection, evaluation, and publication of works that support the improvement of the quality of photography learning at SMK Negeri 1 Pringapus in a sustainable manner and is relevant to the demands of vocational education in the digital era.

METHODOLOGY

This study used *the Research and Development* (R&D) method with the ADDIE development model, which includes the stages of analysis, design, development, implementation, and evaluation. The ADDIE model was selected based on its systematic and flexible characteristics, making it suitable for use in developing technology-based learning media in vocational education.

The research was conducted at SMK Negeri 1 Pringapus, Semarang Regency, with eleventh-grade students of the Visual Communication Design (DKV) program as the subjects. The subjects were divided into two groups: an experimental class using the Google Sites-based Photography Portfolio Information System (SiPoKaF) and a control class taking photography lessons without the use of such media. The experimental and control classes were determined based on the equivalence of the students' initial abilities.

The data collection instruments in this study included a validation questionnaire from media and content experts, a user response questionnaire, and an instrument to assess students' photography skills and creativity. Instrument validity was assessed through expert consensus, while instrument reliability was tested to ensure measurement consistency. The effectiveness instrument was a questionnaire. question pre test And post test has through test validity And reliability. Question the consists of from 10 practice questions tailored to the Learning Outcomes and Learning Objectives in the subject Photography. Validity question pre test And post test use formula Aiken's obtained valid results. The reliability test using the *Percentage of Agreement formula* obtained a significance result of 95.44% with very good criteria.

Data analysis was conducted descriptively and inferentially. Descriptive analysis was used to interpret the results of media feasibility validation and user responses. Inferential analysis was used to test the effectiveness of SiPoKaF through a comparison of pre-test and post-test results between the experimental and control classes, which included normality tests, homogeneity tests, N-Gain calculations, and independent sample t-tests. The results of these analyses were used to determine the feasibility and effectiveness of SiPoKaF in improving the photography skills and creativity of vocational high school students.

RESULTS OF RESEARCH AND DISCUSSION

Development Photography Portfolio Information System (SiPoKaF)

The development of the Photography Portfolio Information System (SiPoKaF) was conducted using the ADDIE model, which includes analysis, design, development, implementation, and evaluation. The ADDIE model was chosen because it offers a systematic and flexible flow in developing technology-based learning media and allows for continuous product adjustments to user needs (Branch, 2021; Molenda, 2020). Each development stage produces interrelated outputs that serve as the basis for refining the digital portfolio system. Based on the research and development conducted, the following research results were obtained:

1. Analysis

The analysis phase aims to identify photography learning needs and the problems faced by teachers and students at SMK Negeri 1 Pringapus. Observation and interview results indicate that photography learning is not supported by a structured digital portfolio system. Students' photographic work is generally stored individually on personal devices without clear classification, making it difficult to use for evaluation and reflection on learning. This condition aligns with the findings of Al-Ali M, Singh R, Al-Ali A, and Pearson (2022), who stated that the absence of an integrated learning

information system impacts the low effectiveness of evaluating and monitoring student skill development.

Curriculum analysis shows that photography competencies in the Visual Communication Design Expertise Program require mastery of technical skills and visual creativity demonstrated through tangible works. Nugroho et al. (2024) emphasized that vocational learning requires media capable of systematically documenting learning processes and products so that student competency development can be properly monitored. The findings at this stage form the basis for the need to develop a digital portfolio system integrated with photography learning.

2. Design

The design phase focused on the structure and workflow of SiPoKaF. At this stage, a system design was developed, encompassing the page structure, navigation flow, and the relationship between learning materials and student portfolios. The system design was kept simple and intuitive for ease of use by both students and teachers. The principle of user-friendliness in web-based learning media design was a primary concern, as suggested by Bhatnagar and Mehta (2021) that ease of navigation and clear visual displays influence student learning engagement.

The SiPoKaF structure includes a homepage, a photography materials page, a student portfolio page, and a feedback section. The portfolio page design is aligned with assessment indicators for photography skills and creativity, so that each uploaded work can be directly linked to learning outcomes. This approach aligns with Zubizarreta's (2020) view that digital portfolios are effective when designed in alignment with clear learning objectives and assessment criteria.

3. Development

During the development phase, the draft was implemented into a Google Sites-based SiPoKaF. Google Sites was chosen for its ease of use, flexibility, and integration with the Google Workspace ecosystem, which supports collaborative learning (Rikani et al., 2021; Nugroho et al., 2023). The system was developed to support the presentation of visual content, uploading photographic works, and providing online feedback.

The SiPoKaF product includes individual student portfolio pages that allow for structured and continuous uploading of work. Each work is accompanied by a brief description explaining the concept, technique, and visual idea, encouraging students to reflect on the creative process. According to Daodu et al. (2024), reflective activities in digital portfolios contribute positively to the development of students' creativity and metacognitive awareness. The developed products are then validated by media and content experts to ensure feasibility before implementation.

4. Implementation

The implementation phase involved applying SiPoKaF to photography lessons in the experimental class, while the control class conducted lessons without the system. At this stage, students were instructed to upload their photographic work to SiPoKaF as part of the project-based learning process. Teachers utilized the system to monitor the progress of their work, provide feedback, and conduct ongoing learning evaluations.

The implementation results showed that students were able to use SiPoKaF independently to manage their photography portfolios. Student work was documented more neatly and systematically, and easily traced. This finding aligns with Purwanto et al. (2021) who stated that digital-based learning systems can enhance student learning independence and active engagement.

5. Evaluation

The evaluation phase was conducted to assess the feasibility and effectiveness of SiPoKaF. The feasibility evaluation was conducted through assessments by media and content experts, while the effectiveness evaluation was conducted through analysis of student learning outcomes. The evaluation results showed that SiPoKaF met the feasibility criteria and had a positive impact on photography learning.

Evaluations also show that SiPoKaF functions not only as a repository for work but also as a reflective and collaborative learning tool. Continuous documentation of work allows

students to see the development of their abilities over time, while teachers gain a more comprehensive picture of student competency achievement. This aligns with the educational concept of the Society 5.0 era, which emphasizes the use of digital technology to support creativity and human skill development (Fukuda, 2020).

Results

Eligibility Photography Portfolio Information System (SiPoKaF)

The feasibility of SiPoKaF was assessed through validation by media and subject matter experts. This assessment aimed to ensure that the developed digital portfolio system was suitable for use as a supporting medium for photography learning. The results of the SiPoKaF feasibility analysis by the media and subject matter experts are shown in the table below.

Table 1. Test Results Eligibility SiPoKaF Expert Media

No	Aspect	Validator				Average	Category
		1	2	3	4		
1	Display design	4.3	5	4.3	5	4.67	Very Worthy
2	Navigation and interactivity	4.6	5	4.3	5	4.75	Very Worthy
3	Technical quality	4.6	5	5	5	4.92	Very Worthy
4	Conformity with multimedia learning principles	4.7	4.3	4.3	5	4.58	Very Decent
5	Collaborative functions and documentation	4.3	5	4.7	5	4.75	Very Decent
6	Acceptability	5	5	4.3	5	4.8	Very Decent
Overall average of media members = 4,75 (Very Deserving)							

Based on the results of media expert validation of the Photography Portfolio Information System (SiPoKaF), the technical quality aspect obtained the highest average score of 4.92, which indicates that the system is considered to have stable performance, is easily accessible, and functions well when used. A high score on this aspect indicates that SiPoKaF is able to support the learning process without significant technical obstacles, both in terms of access speed and system reliability. From table 1, the overall average value is 4.75 with a very feasible category. These results indicate that SiPoKaF meets the eligibility criteria as a digital learning media that can be used in photography learning in vocational schools. The results of the SiPoKaF feasibility test by material experts are shown in Table 2.

Table 2. Test Results Eligibility E-modul Expert Material

No	Aspect	Validator				Average	Category
		1	2	3	4		
1	Suitability of material	3.9	4.7	4.3	4.3	4.3	Very Worthy
2	Accuracy and scientificity	4.4	4.8	4.4	4.4	4.5	Very Worthy
3	Update of material	4	4	4	4	4	Worthy
4	Presentation of material	4.8	4.8	4.3	4.3	4.5	Very Worthy
5	The relationship between creativity and skills	4.3	4.5	4.8	4.8	4.5	Very Worthy
6	Contextual and applicable	4.3	4.3	4.3	4.3	4.4	Very Worthy
Overall average of media experts = 4.4 (Very Good)							

Based on the validation results by material experts on the learning content in the Photography Portfolio Information System (SiPoKaF), an overall average score of 4.40 was obtained, categorized as very suitable. This result indicates that the photography material presented in SiPoKaF meets the eligibility criteria as supporting teaching materials for photography learning in vocational schools.

Effectiveness Photography Portfolio Information System (SiPoKaF)

The effectiveness of SiPoKaF was tested by comparing learning outcomes between the experimental class using SiPoKaF and the control class not using the media. The testing was conducted using pre-test and post-test data on students' photography skills and creativity. The *post-test* stage for the experimental class was conducted after being given treatment using SiPoKaF photography materials, while the control class learned as usual without using SiPoKaF media. The following are the results of the descriptive analysis stages, normality tests, homogeneity tests, t-tests, and *N-Gain tests* conducted to determine the effectiveness of using SiPoKaF media.

Table 3. Results of descriptive statistics

Descriptive Statistics					
	N	***Minimum***	***Maximum***	***Mean***	***Standard Deviation***
Posttest control	35	58	82	68.57	4.408
Experimental posttest	35	82	100	93.60	4.360
Valid N (listwise)	35				

Based on the descriptive statistics results on the post-test data, differences in learning outcomes were obtained between the control class and the experimental class. In the control class, the number of respondents was 35 students with a minimum score of 58 and a maximum score of 82. The average score (mean) obtained by the control class was 68.57 with a standard deviation of 4.408, which indicates that the distribution of student scores was relatively homogeneous.

Meanwhile, in the experimental class, which also consisted of 35 students, the minimum score was 82 and the maximum score was 100. The average score (mean) of the experimental class was 93.60 with a standard deviation of 4.360. These results indicate that student learning outcomes in the experimental class were higher than those in the control class, with relatively uniform value variations.

Based on the comparison of the average values, it can be seen that the use of the Photography Work Portfolio Information System (SiPoKaF) in the experimental class provided more optimal learning outcomes compared to learning in the control class which did not use this media.

Table 4. Test Results Normality

Tests of Normality

	Kolmogorov-Smirnov [a]			**Shapiro-Wilk**		
	Statistics	**df**	**Sig.**	**Statistics**	**df**	**Sig.**
Pretest control	.143	35	.066	.956	35	.169
Posttest control	.144	35	.063	.949	35	.106
Experimental pretest	.142	35	.073	.969	35	.413
Experimental posttest	.138	35	.092	.950	35	.110
a. Lilliefors Significance Correction						

Based on Table 4, the results of the normality test using **the Kolmogorov–Smirnov** and **Shapiro–Wilk tests** , all *pretest* and *posttest data* in both the control and experimental classes showed a significance value greater than **0.05** . These results indicate that the data are normally distributed, thus fulfilling the prerequisites for parametric statistical analysis in the next stage.

Table 5. Homogeneity Test Results Post test

Test of Homogeneity of Variance					
		Levene Statistic	**df1**	**df2**	**Sig.**
Posttest results	Based on Mean	.014	1	68	.905
	Based on Median	.007	1	68	.935
	Based on Median and with adjusted df	.007	1	64.790	.935
	Based on trimmed mean	.002	1	68	.963

Based on table 5, Based on the results of the homogeneity of variance test using **Levene's Test** , a significance value of **0.905 was obtained** in the *post-test results* based on the average value. The significance value is greater than **0.05** , so it can be concluded that the data variance between the control class and the experimental class is homogeneous. After the prerequisite test was carried out, the next step was the N Gain test analysis to determine the effectiveness of using SiPoKaF. The results of the N Gain test can be seen in table 6.

Table 6. Test N Gain

Class	**Average N-Gain**	**Category**
Control	9.73	Ineffective
Experiment	83.28	Effective

Based on the results of the N-Gain calculation, the control class obtained an average score of 9.73% with an ineffective category, while the experimental class obtained an average N-Gain score of 83.28% with an effective category. These results indicate that the increase in student learning outcomes in the experimental class using the Photography Portfolio Information System (SiPoKaF) was higher than in the control class. Thus, the use of SiPoKaF has been proven effective in improving students' photography skills and creativity.

Next, a follow-up Independent t-test will be conducted to determine the differences between the control and experimental groups. The results of this test can be seen in Table 7.

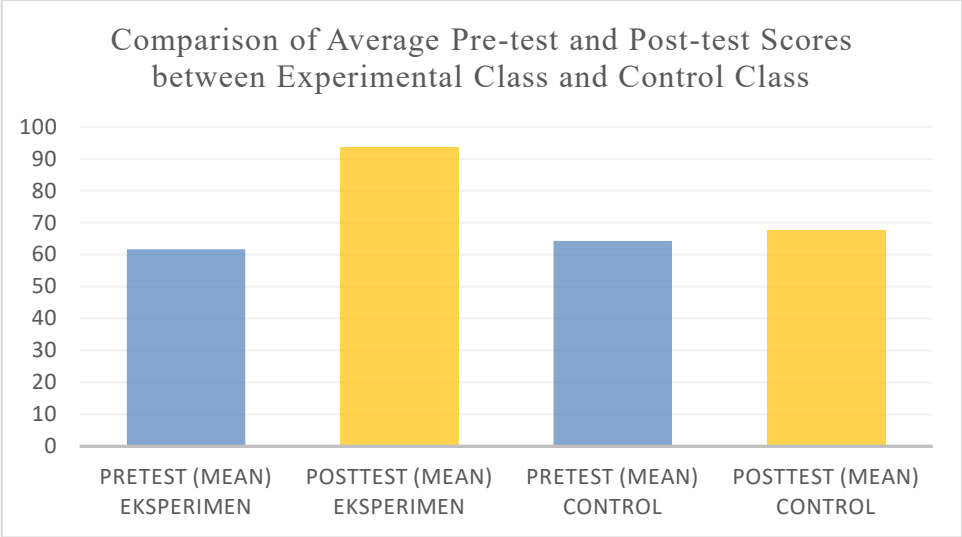
Tabel 7. Independent t Test Post Test Results

Independent Samples Test										
		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
									Lower	**Upper**
Posttest Result	Equal variances assumed	.014	.905	23.707	68	.000	25.829	1.090	23.654	28.003
	Equal variances not assumed			23.707	67.515	.000	25.829	1.090	23.654	28.003

Based on the results of *the independent samples t-test* on the *post-test data* , the Levene's Test significance value was obtained at **0.905** , which is greater than **0.05** , so it can be concluded that the variance of the two groups is homogeneous and the analysis is continued using the assumption of equal variances assumed.

t -test results showed a value of t = 23.707 with df = 68 and a significance value of 0.000 ($p < 0.05$). These results indicate that there is a significant difference between the *post-test results* of the experimental class and the control class. The

average difference (*mean difference*) of 25.829 indicates that the value of student learning outcomes in the experimental class is higher than the control class. Thus, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted, which means that the use of the Photography Portfolio Information System (SiPoKaF) has a significant effect on improving students' photography skills and creativity.



Based on the comparison diagram of the average pretest and posttest scores between the experimental and control classes, a significant difference in learning outcomes is evident. In the experimental class, the average pretest score was 62, then experienced a significant increase in the posttest score to 94. This increase indicates that after being given learning treatment using SiPoKaF, students' abilities and understanding experienced significant development. Meanwhile, in the control class, the average pretest score was 64 and increased to 68 in the posttest. Although there was an increase in learning outcomes, the difference in scores obtained was relatively small compared to the experimental class. This condition indicates that learning carried out without the use of media only provides limited improvements in learning outcomes.

Discussion

The results of the study indicate that the development of a Google Sites-based Photography Portfolio Information System (SiPoKaF) is a relevant solution to address the challenges of photography learning in vocational schools, particularly in the aspects of work documentation, learning evaluation, and the development of student skills and creativity. The feasibility of SiPoKaF obtained through validation by media experts and material experts indicates that this system not only meets technical standards but also aligns with the pedagogical needs of vocational education that emphasizes the integration of theory and practice.

From a student-centered learning perspective, SiPoKaF functions as a digital learning system that encourages active student involvement in managing their learning process. Through digital portfolios, students have control over their work, from planning and implementing photography practices to reflecting on learning outcomes. An integrated digital education system has been shown to increase learning effectiveness and strengthen students' roles as learning subjects (Al-Ali et al., 2023). This demonstrates that the success of SiPoKaF lies not only in the media used, but also in its ability to facilitate meaningful learning.

Media expert validation results indicate that the interface and navigation design of SiPoKaF are highly suitable. The simple, consistent, and easy-to-understand interface makes it easy for students to upload and review their photographic work. Web-based learning media with an intuitive design positively impacts

student motivation and independence, particularly in vocational education, which demands practical skills (Bhatnagar & Mehta, 2021). Thus, the design aspects of SiPoKaF directly contribute to its effectiveness in photography learning.

In terms of material, SiPoKaF is considered highly appropriate because the photography content presented is aligned with the learning outcomes and competencies of the Visual Communication Design Expertise Program. The integration of theoretical material and practical portfolio uploads allows students to understand the relationship between photography concepts and their application in real-life work. Digital portfolios designed in alignment with learning objectives serve as an effective means of reflection and strengthen students' mastery of competencies (Zubizarreta, 2020).

the N-Gain calculation show that the increase in student learning outcomes in the experimental class is in the high category, while the control class is in the low to moderate category. These findings indicate that the use of SiPoKaF makes a significant contribution to improving technical photography skills, such as mastery of composition, lighting, and image sharpness, as well as aspects of creativity that include originality of ideas and visual innovation. These results strengthen the findings of Nugroho et al. (2024) who stated that the integration of digital portfolios in vocational learning can significantly improve the quality of students' work.

An independent sample t-test on the post-test results showed a significant difference between the experimental and control classes. These results indicate that the improvement in students' photography skills and creativity did not occur by chance, but rather as a result of the use of SiPoKaF in the learning process. The existence of a digital portfolio system encourages students to be more responsible for their work because each piece is documented and can be reviewed. These findings align with those of Al-Ali M, Singh R, Al-Ali A, and Pearson (2022), who emphasized that an integrated learning information system can improve the quality of student evaluation and learning outcomes.

The effectiveness of SiPoKaF is reflected in the results of empirical tests, which showed a significant increase in students' photography skills and creativity in the experimental class. The N-Gain value, which is in the effective category, indicates that the use of SiPoKaF has a significant impact on improving learning outcomes compared to conventional learning. This improvement includes technical photography skills, such as mastery of composition, lighting, and image sharpness, as well as aspects of creativity, including originality of ideas and visual exploration. These findings support previous research that stated that integrating digital portfolios in vocational learning can significantly improve the quality of students' work (Daodu et al., 2024).

These improvements in learning outcomes can be explained through the constructivist learning approach facilitated by SiPoKaF. Students' reflective activities, such as writing work descriptions and documenting the process, foster a deeper understanding of the learning experience. Constructivist learning environments supported by digital technology have been shown to enhance creativity, critical thinking skills, and metacognitive awareness in vocational education students (Daodu et al., 2024).

From a learning evaluation perspective, SiPoKaF supports the implementation of authentic *assessment* . Assessment focuses not only on final results but also on the process and ongoing development of student competencies. Digital portfolios enable teachers to assess learning outcomes based on concrete evidence of student work. Continuously developed e-portfolios can represent *deep learning* through a combination of evidence of student work production and critical reflection (Ayaz et al., 2022).

The existence of SiPoKaF also strengthens the feedback function in photography learning. Teachers can provide constructive feedback on each student's uploaded work, providing students with clear guidance for future improvement. Recent meta-analytic studies and reviews confirm that the quality of feedback (clear, specific, process-focused, and self-regulatory) significantly determines its effectiveness in improving learning outcomes—therefore, documented feedback on

digital portfolio platforms has the potential to significantly impact learning (Wisniewski, Zierer, & Hattie, 2020).

In the context of project-based learning, SiPoKaF supports the main characteristics of photography learning in vocational schools, which emphasizes the production of tangible works. Each photography assignment can be positioned as a learning project documented in a digital portfolio. Project-based learning has been proven effective in improving practical skills, creativity, and problem-solving abilities in vocational education students (Kokotsaki et al., 2016). Thus, SiPoKaF becomes an integral part of a project-based learning strategy relevant to the characteristics of vocational education.

Furthermore, the use of SiPoKaF contributes to the development of students' digital literacy. Through web-based portfolio management, students become accustomed to using digital technology productively and responsibly. Digital literacy is a crucial competency for vocational school graduates, particularly in the creative industries, which are highly dependent on technology (UNESCO, 2018).

The role of teachers as facilitators is becoming increasingly important in the implementation of SiPoKaF. The shift in the teacher's role from "answer provider" to "process guide" in line with 21st-century learning practices supports reflection, collaboration, and authentic assessment. Recent studies on project-based learning and 21st-century skills development emphasize the need for teachers to take a facilitative role to maximize learning outcomes through structured activities and continuous feedback support (Artama, 2023).

The pedagogical implications of implementing SiPoKaF include changes in assessment practices, improved feedback quality, and a strengthened culture of reflection and documentation of work in the classroom. Furthermore, the digital portfolios produced during the learning process can be used by students as professional portfolios when applying for jobs or continuing their studies, thereby increasing their *employability* (Ciesielkiewicz, 2019).

In the context of vocational education in the Society 5.0 era, SiPoKaF holds strategic relevance because it supports the integration of digital technology with the development of creativity and human potential. Digital portfolios are a key indicator of graduates' competency and work readiness in the creative industries (Fukuda, 2020). The portfolios produced during the learning process can also be used by students as professional portfolios after graduation, thereby enhancing their competitiveness and employability (Ciesielkiewicz, 2019).

Based on the overall results and discussion, it can be emphasized that the Google Sites-based SiPoKaF serves not only as a storage medium for works, but also as a learning system that supports reflection, authentic assessment, creativity development, and student work readiness. Thus, SiPoKaF is an effective, relevant, and sustainable photography learning innovation in the context of vocational high school (SMK) vocational education.

CONCLUSION

This research resulted in a Google Sites-based Photography Portfolio Information System (SiPoKaF) that was proven to be feasible and effective for use as a supporting medium for photography learning in vocational high schools. The validation results from media experts and material experts showed that SiPoKaF met the eligibility criteria in terms of technical quality, interface design, navigation, and the suitability of the material to the learning outcomes of the DKV expertise program. These findings indicate that SiPoKaF is pedagogically and technologically relevant for application in practice-based photography learning. The effectiveness test showed that the use of SiPoKaF had a significant impact on improving students' photography skills and creativity. Students in the experimental class who used SiPoKaF achieved higher learning outcomes than those in the control class, as evidenced by an increase in posttest scores and the results of the N-Gain analysis with an effective category. The significant difference between the two groups confirmed that the integration of digital portfolios in photography learning can improve the quality of the process and student

learning outcomes. In addition to improving skills and creativity, SiPoKaF also functions as a means of reflective learning and authentic assessment that supports active student involvement. Systematic documentation of work allows students to reflect on their learning progress, while teachers obtain a more comprehensive picture in conducting learning evaluations. Thus, SiPoKaF serves not only as a repository for works but also as a learning system that supports the development of digital literacy, learning motivation, and student readiness for the world of work in the creative industries. Therefore, SiPoKaF is recommended as an alternative digital-based photography learning medium relevant to the needs of vocational education in the Society 5.0 era.

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