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Digital-Based Interactive Teaching Module for Prospective Teachers: SBdP Learning Supplement to Improve Elementary School Student Learning Outcomes

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Abstract: This study aims to develop and evaluate the feasibility, practicality, and effectiveness of digital-based interactive teaching materials for Arts, Culture, and Crafts (SBdP) learning in elementary schools. The research employed a Research and Development (R&D) method using the ADDIE model, which consists of five stages: analysis, design, development, implementation, and evaluation. The research participants included three expert validators, five SBdP teachers, and students from two elementary schools. The instruments used in this study comprised expert validation sheets, teacher and student practicality questionnaires, and pre-test and post-test assessments of learning outcomes. The data were analyzed using descriptive statistics, normality testing (Kolmogorov–Smirnov), homogeneity testing (Levene's test), a paired-sample t-test, and normalized gain (N-gain) analysis. The findings indicate that the developed interactive teaching materials are highly feasible across all assessed aspects, including content, language, graphics, didactics, construction, and technical quality. Teacher evaluations categorized the materials as very good, while students reported that they were easy to use, engaging, and helpful in improving conceptual understanding. The effectiveness test revealed a significant improvement in learning outcomes in both schools, with mean scores increasing from 45.60 to 74.70 and from 38.22 to 71.38, respectively. The hypothesis testing results showed that F_count > F_table, indicating a statistically significant difference. Furthermore, the N-gain analysis demonstrated that most students achieved a moderate level of improvement. In conclusion, the developed digital-based interactive teaching materials are valid, practical, and effective in enhancing SBdP learning outcomes in elementary schools.

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Introduction

The development of 21st-century education requires the application of adaptive, creative, and technology-based learning to prepare a generation capable of competing in a dynamic global environment (Saleem et al., 2024; Atmojo et al., 2025; Nouri et al., 2020; Muyambo-Goto et al., 2023; Joynes et al., 2019). Digital transformation in the education sector has encouraged the emergence of various learning innovations (Scippo et al., 2024; Zhao et al., 2023), one of which is through the use of digital-based interactive teaching modules. Digital modules are not only an alternative teaching material, but also serve as a learning medium that can integrate text, images, audio, video, and interactive simulations that encourage a richer, more personalized, and meaningful learning experience (Mas'ud et al., 2021; Budi et al., 2024). The design of this module was guided by the Cognitive Theory of

Multimedia Learning developed by Mayer (2001), particularly the Multimedia, Modality, Segmenting, Signaling, and Coherence Principles, to optimize cognitive processing and minimize extraneous cognitive load. In the context of elementary education, especially in Arts, Culture, and Crafts (SBdP), the development of innovative teaching modules is increasingly important due to the subject's emphasis on practical skills, artistic appreciation, creativity, and expressive learning activities.

However, various studies show that SBdP learning in many elementary schools still faces significant challenges. Teachers tend to use conventional methods centered on lectures and limited demonstrations, while the teaching materials used are often textual and lack the visual and interactive experiences needed to foster student creativity. The mismatch between the characteristics of SBdP material and the learning approaches used has resulted in low learning interest, student engagement, and learning outcomes. These findings are in line with the results of international research which states that arts learning requires a multimodal, exploratory, and experience-based approach to develop students' creativity and aesthetic appreciation (Hicyilmaz, 2025; Møller-skau & Lindstøl, 2022; Mustafa & Döş, 2024). Additionally, the limited readiness of prospective elementary schosol teachers in developing and utilizing technology-based teaching media is also a fundamental issue, especially considering that they will become the spearhead of digital pedagogical transformation in schools (Tondeur et al., 2016) .

A number of previous studies have shown the effectiveness of digital modules in improving students' conceptual understanding, learning motivation, and learning outcomes in various subjects (Zhang et al., 2024; Dafit et al., 2024; Kemendikbud, 2017; Solihudin, 2018). The *Cognitive Theory of Multimedia Learning* (Mayer) asserts that multimodal integration in learning media can strengthen the process of information comprehension and minimize *cognitive overload* when designed appropriately. Similarly, *Constructivism* and *Social Constructivism* theories emphasize the importance of active, collaborative, and contextual learning experiences that can be facilitated through interactive digital teaching materials, in line with research confirming that digital environments provide great opportunities for exploratory activities and knowledge construction (Jonassen, 2014; Kim, 2018). However, studies on the development of digital-based interactive teaching modules specifically aimed at prospective teachers to strengthen SBdP learning are still very limited. Most studies focus more on science, mathematics, or language subjects, while SBdP, which has distinctive characteristics in terms of aesthetics, art appreciation, and practical skills, still receives little attention (Hartutik et al., 2024) .

The research gap is also evident in the lack of studies that place prospective teachers as key subjects in the development and implementation of digital modules. In fact, global literature emphasizes the importance of *technological pedagogical content knowledge* (TPACK) for prospective teachers to be able to effectively integrate technology into learning (Arifuddin et al., 2025; Hasriadi & Nurul, 2023; Handini, 2025; Simangunsong et al., 2023). There has been little research examining how digital interactive teaching modules can serve as learning supplements for prospective teachers while also improving the quality of elementary school students' learning in SBdP subjects. This is where the contribution of this study becomes relevant.

The main novelty of this study lies in its dual approach, which integrates the development of digital-based interactive teaching modules and tests their effectiveness as a learning supplement for SBdP to improve the learning outcomes of elementary school students. These modules are not only designed as ready-to-use teaching materials but also as

Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 384-396

pedagogical tools that strengthen prospective teachers' competence in designing technology-based learning experiences. In addition, the module was developed with consideration of the principles of multimedia learning, the SBdP curriculum requirements, the developmental characteristics of elementary school children, and the integration of interactive features that allow students to explore artistic concepts in greater depth, something that has not been widely presented in previous studies. Therefore, the primary objective of this study is to develop a digital-based interactive SBdP teaching module for prospective teachers and to examine its feasibility, practicality, and effectiveness in improving elementary school students' learning outcomes. This study seeks to address the limited integration of technology-based innovation in SBdP instruction by providing a systematic development procedure and measurable empirical evidence regarding its instructional impact.

Research Method

This study employed a Research and Development (R&D) approach using the ADDIE framework (Analysis, Design, Development, Implementation, and Evaluation) to systematically develop and test a digital-based interactive SBdP teaching module. In the analysis stage, a needs assessment was conducted to identify limitations in existing SBdP teaching materials, challenges in integrating digital technology, and the readiness of prospective teachers to design technology-based learning. The design stage involved preparing learning objectives, structuring content, selecting interactive features, and organizing activities based on multimedia learning principles and SBdP curriculum standards.

During the development stage, the module was produced with integrated visual elements, structured explanations, interactive exercises, and evaluation components. The product was then validated by experts in language, educational technology, and SBdP subject matter to ensure content accuracy, pedagogical appropriateness, graphic quality, and technical feasibility. Revisions were made based on expert feedback before proceeding to implementation.

The implementation stage involved limited trials in elementary school settings. The participants consisted of five SBdP teachers selected purposively to assess practicality from a practitioner perspective, as well as students from SD 182 Pekanbaru and SD 08 Pekanbaru. Student testing was conducted in three stages: one-to-one trials, small group trials, and field tests that reflected actual classroom conditions. A total of 37 students participated in the effectiveness testing phase.

The instruments used included expert validation sheets covering content, language, graphics, didactics, construction, and technical aspects; practicality questionnaires for teachers and students to measure usability, clarity, readability, and interactivity; and learning outcome tests in the form of pretests and posttests to determine effectiveness. Data analysis included percentage feasibility calculations, average practicality scores, normality and homogeneity testing, paired t-test analysis to examine score differences, and normalized gain calculations to measure the magnitude of learning improvement. Throughout the research process, ethical considerations were maintained by obtaining permission from the schools, informing participants about the research objectives, and ensuring confidentiality through anonymous data coding.

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Vol. 13 No. 2 : April 2026
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pp. 384-396

Results and Discussion

Needs Analysis

A needs analysis was conducted to examine the current condition of SBdP learning in elementary schools and the readiness of prospective teachers to use digital media. The findings revealed that SBdP instruction, particularly in fine arts and art appreciation, is still dominated by static and print based materials such as textbooks and worksheets. This limits students' opportunities for visual exploration, creativity, and multisensory learning experiences, which are essential characteristics of SBdP. Teachers reported difficulties in explaining visually oriented concepts such as drawing techniques, visual elements, and examples of regional artworks without the support of dynamic and interactive media.

From a pedagogical perspective, teachers emphasized the need for more interactive and visually rich learning resources to increase student motivation and engagement. This need aligns with the implementation of the Merdeka Curriculum and the Deep Learning approach, which promote creativity, experiential learning, and digital literacy. Therefore, digital based modules are required not only as supplementary tools but as strategic solutions to bridge the gap between curriculum demands and classroom practice. The analysis also showed that prospective teachers possess basic digital skills but lack the ability to systematically design interactive teaching materials and integrate multimedia elements based on instructional design principles. Additionally, existing teaching materials were considered insufficient in terms of readability, graphic quality, and structured content suited to the characteristics of elementary school students. These findings underline the importance of developing a digital based interactive SBdP module that supports student learning while also serving as a practical pedagogical model for prospective teachers.

Design

The design stage aimed to ensure that the digital based interactive teaching module had a clear conceptual structure and appropriate instructional framework before being developed into a prototype. At this stage, learning pathways, measurable objectives, and pedagogical strategies were formulated based on the needs analysis and aligned with the characteristics of SBdP subjects as well as the Merdeka Curriculum. The learning objectives emphasized not only conceptual understanding, but also creativity, art appreciation, and the use of technology as a medium of expression.

A module blueprint was then developed, including a competency map, sequence of materials, presentation strategies, and digital interaction models. The content was organized using a chunking approach so that materials were presented in small, manageable units suitable for elementary students. Each unit included concept explanations, visual illustrations, examples of artwork, practical activities, and exercises designed to promote active learning and visual exploration. Multimedia elements such as images, short demonstration videos, interactive navigation buttons, and digital worksheets were carefully selected based on cognitive load principles to support understanding without overwhelming students. Interactive quizzes were designed in a simple multiple choice format to support formative assessment. The interface design emphasized simplicity, consistency, and visual clarity, with appropriate colors, typography, and layout suited to elementary learners. Overall, this stage ensured that the module functioned not only as an instructional tool for students but also as a practical pedagogical model that prospective teachers could use as a reference for designing effective digital learning media.

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Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 384-396

Development

The development stage is carried out after the requirements for digital-based interactive teaching modules have been successfully identified in the analysis phase. At this stage, researchers produce a teaching module *prototype* which is then validated by experts and tested for feasibility by users (teachers). Validation is carried out to ensure that the teaching module meets the quality standards for teaching materials in terms of content feasibility, language, presentation, and digital technology. The assessment involves three expert validators, namely a language expert, an educational technology expert, and a subject matter expert, as well as five classroom teachers as users. Expert validation aims to assess the suitability of the teaching module *prototype* with curriculum standards, language accuracy, presentation accuracy, and technical feasibility as interactive teaching materials. The validation results are shown in Table 2 below.

Table 1. Assessment of 3 Expert Validators on Interactive Teaching Materials

Assessment Aspect	∑	max	%	Category
Teaching Material Eligibility Requirements				
Didactic Requirements	71	75	94.67	Very Good
Construction Requirements	142	150	94.67	Very Good
Technical Requirements	37	45	82.22	Good
Teaching Material Suitability				
Content Suitability Aspect	93	105	88.57	Good
Linguistic Aspects	79	90	87.78	Very Good
Graphic Aspects	39	45	86.67	Good
Total	461	510	90.39	Very Good

Based on the expert validation results in the table above, the total feasibility percentage reached 90.39% with a Very Good category, indicating that the interactive teaching module is considered feasible for use in SBDP learning. The didactic and construction aspects received the highest score (94.67%), indicating that the presentation of material, clarity of learning objectives, and module structure are in accordance with the criteria for developing teaching materials. Although the technical aspect has the lowest percentage (82.22%), it is still in the good category and only requires minor improvements related to navigation and digital display consistency. Overall, expert validators assessed that the module has met academic, technical, and linguistic feasibility standards. In addition to expert assessment, the interactive teaching module was also assessed by five teachers as direct users. User assessment aims to see the extent to which the module is easy to understand, relevant to learning needs, and practical to use in a classroom context. The assessment results are shown in Table 2 below.

Table 2. User Assessment (5 Teachers) of Teaching Materials

Assessment Aspects	∑	max	%	Category
Teaching Material Eligibility Requirements				
Didactic Requirements	113	125	90.40	Very Good
Construction Requirements	232	250	92.80	Very Good
Technical Requirements	67	75	89.33	Very Good
Teaching Material Suitability				
Content Suitability Aspect	164	175	93.71	Very Good
Linguistic Aspects	141	150	94.00	Very Good
Graphic Design Aspects	64	75	85.33	Good
Total	781	850	91.88	Very Good

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Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 384-396

Based on the table above, user assessment resulted in a suitability percentage of 91.88% with a rating of Excellent. All aspects scored above 85%, indicating that the interactive teaching module is considered highly feasible, easy to use, and relevant to classroom learning needs. The linguistic aspect received the highest score (94.00%), indicating that the usage instructions, material narration, and activity instructions are easy to understand and ready to be applied to students. Meanwhile, the graphic design aspect received a score of 85.33% and was categorized as good, requiring minor improvements related to color harmony and illustrations. Overall, teachers stated that the module was very helpful in delivering SBDP material and had great potential to improve the quality of learning.

Implementation Stage

The implementation stage was carried out to test the applicability and practicality of the interactive teaching module when used in SBdP learning in the classroom. The trial was conducted through three levels, namely a one-to-one test, a small group/class test (student practicality), and teacher assessment of learning implementation. The results of this stage provided an overview of how the module was responded to by students and teachers in a real learning context.

One-to-One Test (Individual Test)

One-to-one tests were conducted on four students with varying academic abilities. The purpose of this stage was to identify the ease of use of the module on an individual basis, including understanding of the material, readability of the language, and ease of display.

Table 3. Student Responses in the One-to-One Test

No	Student	Number of Scores		Category
1	Student 1	72	80	Good
2	Student 2	83	92.22	Very Good
3	Student 3	72	84	Good
4	Student 4	79	87.77	Very Good

Based on the table above, the test results show that two students gave the category Very Good, while the other two gave the category Good. This indicates that in the early stages of using the module, students individually understood the content, followed instructions, and operated the module well without experiencing significant obstacles. The one-to-one test assessment was also analyzed based on three main sub-indicators.

Table 4. Student Responses per Sub-Indicator

No	Sub-Indicator	Number of Scores	Max Score		Category
1	Content Suitability	117	140	83.57	Good
2	Language	110	120	91.67	Very Good
3	Graphics	49	60	81.66	Good
Total		**276**	**320**	**86.25**	**Very Good**

Based on the table above, it can be seen that the language sub-indicator received the highest score, indicating that the instructions and sentences in the module are very easy for students to understand. The content and graphics are also in the good category, showing that the structure of the material and visual appearance are appropriate for elementary school students. Overall, the module in the individual test is in the Very Good category (86.25%).

Student Practicality Test (Class)

After undergoing individual testing, the module was tested in two classes at two schools (SD 182 and SD 08) to see the practicality of the module in the actual learning context by involving more students.

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Jurnal Penelitian dan Pengembangan Pendidikan
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Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 384-396

Table 5. Student Responses in the Class Practicality Test

No	School Name	Number of Students	Number of Scores		Category	Individual Response	
						SB	B
1	SD 182	19	1473	82.83	Good	8	9
2	SD 08	20	1667	92.66	Very Good	8	7
Total						16	16
Percentage						41.02	41.02

Based on the results of the practicality test, student responses to the use of interactive teaching materials showed a positive trend in both schools. At SD 182, 19 students gave a total score of 1473 with a percentage of 82.83%, which is in the Good category. Individual responses at this school showed that 8 students gave a rating of "Very Good" and 9 students gave a rating of "Good". Meanwhile, at SD 08, 20 students gave a total score of 1667 with a percentage of 92.66%, which is in the Very Good category. Individual responses consisted of 8 students who gave a rating of "Very Good" and 7 students who gave a rating of "Good". When combined, the total individual responses from both schools show that 16 students are in the "Very Good" category and 16 students are in the "Good" category. In addition, 17.96% of other students are in the "Fair" category, which indicates that a small number of students still need adaptation or additional support in utilizing interactive teaching materials. To see which aspects were most prominent in the use of the module, student practicality assessments were analyzed based on three main sub-indicators.

Table 6. Student Practicality per Sub-Indicator

No	Sub-Indicator	Number of Scores	Maximum Score		Category
1	Content Suitability	1277	1365	93.55	Very Good
2	Language	963	1170	82.30	Good
3	Graphics	449	585	76.75	Good
Total		**2689**	**3120**	**86.19**	**Very Good**

Based on the table above, it can be seen that the content feasibility aspect received the highest percentage (93.55%) with a Very Good category, indicating that the module materials and activities are in line with the SBdP learning objectives. The linguistic and graphic aspects received a Good category, indicating that the module is easy to understand and has an attractive appearance for students. Overall, the students' practicality score is in the Very Good category (86.19%).

Teacher Assessment of Learning Implementation

In addition to student responses, teacher assessments were conducted to determine the effectiveness of the module from the perspective of educators who used the module directly in teaching.

Table 7. Individual Teacher Assessment

No	Teacher	Number of Scores	Average	Category
1	Teacher 1	171	4.38	Very Good
2	Teacher 2	171	4.38	Very Good
3	Teacher 3	195	5.00	Very Good
4	Teacher 4	178	4.60	Very Good
5	Teacher 5	159	4.10	Good

The teacher assessment in the table above shows that four out of five teachers gave the category Very Good, while one teacher gave the category Good. These findings indicate that, in general, teachers consider the interactive module to be very suitable for use in

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Email:paedagogy@undikma.ac.id

Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 384-396

learning. Teachers assessed that the module was easy to integrate into the teaching flow, helped explain SBdP material, and was able to increase student engagement and focus during the learning process. In addition, the average score above 4.00 confirms that the module was positively received and considered to add value to the quality of learning. To obtain a more specific picture of which aspects were most prominent, an analysis of teacher assessments per learning aspect was conducted.

Table 8. Teacher Assessment per Learning Aspect

No	Assessment Aspect	Number of Scores	Average	Category
1	Subject Matter	227	4,540	Very Good
2	Learning Process	244	4,436	Very Good
3	Module Implementation	248	4,960	Very Good
4	Graphics	161	4,600	Very Good

Based on the table above, all aspects of teacher assessment received an excellent rating, with the highest score in the module implementation aspect (average 4.960). This shows that teachers found the module very easy to use, efficient, and able to support SBdP learning strategies well. The aspects of material, learning process, and graphic design also received high appreciation, which means that the module is not only academically relevant but also visually appealing and helps facilitate the teaching process. These teacher assessment results are in line with the students' practicality results, reinforcing the finding that interactive modules are not only understood and liked by students, but also greatly support the role of teachers in delivering material more effectively and interestingly.

Evaluation Stage

The evaluation stage was conducted to determine the effectiveness of the interactive teaching materials that had been developed and implemented in two elementary schools. The evaluation focused on improving learning outcomes through a comparison of pretest and posttest scores, while also testing the necessary statistical assumptions, including normality, homogeneity, and paired tests. This procedure was carried out to ensure that the improvement that occurred was not merely coincidental, but was a real effect of using interactive teaching materials. In addition, the gain index was also calculated to determine the level of improvement in learning outcomes in more depth.

The initial stage of the evaluation was carried out by comparing the pretest and posttest scores at both schools. The data showed that before learning using interactive teaching materials, the average scores of students were still in the low to moderate category. After learning, there was a significant increase at both schools.

Table 9. Comparison of Pretest and Posttest Scores

School Name	Pretest		Posttest	
	Mean	SD	Mean	SD
SD 182	45.60	16.6081	74.70	10.0582
SD 08	38.22	12.9367	71.38	11.1415

Based on Table 9, it can be seen that there was a significant increase in learning outcomes at both schools after the use of interactive teaching materials. At Elementary School 182, the average pretest score of 45.60 with a standard deviation of 16.6081 increased to 74.70 on the posttest with a standard deviation of 10.0582.

A similar thing happened at Elementary School 08. The average pretest score was 38.22 with a standard deviation of 12.9367, increasing to 71.38 on the posttest, with a standard deviation of 11.1415. This pretty big increase shows that the learning module had a positive impact on the students' understanding of the concepts. Overall, the data in the table

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Vol. 13 No. 2 : April 2026
E-ISSN: 2722-4627
pp. 384-396

shows that digital-based interactive teaching materials were able to consistently improve SBdP learning outcomes in two different schools. In terms of the difference in average scores, the increase at Elementary School 182 reached 29.10 points, while at Elementary School 08 it reached 33.16 points, confirming that the teaching materials had a strong influence on improving mastery of the material. Before conducting the difference test, a normality test was carried out to ensure that the data met the assumptions of normal distribution. The normality test used a significance level of 0.05. The results showed that all data, both pretest and posttest, were in the normal category, so that parametric analysis could be continued.

Table 10. Normality Test for Pretest and Posttest

No	School	*n*	*Pretest* Sig	*Posttest* Sig	Conclusion
1	SD 182	18	0.921	0.092	Normal
2	SD 08	20	0.092	0.071	Normal

After the data was declared normal, a paired test was conducted to see if there was a significant increase between the pretest and posttest. The results of the analysis showed that in both schools, the calculated F was much greater than the table F, which means that there was a significant difference between the pretest and posttest scores. These findings confirm that the use of interactive teaching materials is effective in improving student learning outcomes.

Table 11. Pretest and Posttest Difference Test

No	School	*n*	*F. Table*	*F. Calculation*	Conclusion
1	SD 182	20	2.09302	8.62884	Increasing
2	SD 08	18	2.10981	13.2252	Increased

Furthermore, to strengthen the evidence of learning improvement, a gain index analysis was conducted to measure the effectiveness of learning in more detail. The gain index was categorized into high, medium, and low. The normalized gain analysis showed an average gain score of g = 0.53 at SD 182 and g = 0.54 at SD 08, both classified in the medium category. These findings indicate that interactive teaching materials provide consistent, stable learning improvement that can be applied in various school conditions.

Table 12. Gain Index of Student Learning Outcome Improvement

No	School	*n*	High	Medium	Low
1	SD 182	20	2	16	2
2	SD 08	18	3	13	2

Overall, the evaluation results show that the interactive teaching materials developed are not only valid and practical, but also empirically effective in improving student learning outcomes in two different schools.

The results of this study indicate that the development of digital-based interactive teaching modules for SBdP addresses unmet learning needs from the perspectives of students, teachers, and prospective teachers. The needs analysis showed that SBdP instruction is still dominated by static and conventional materials, limiting visual exploration and multisensory learning. This finding is consistent with Zuhro et al (2025), who reported that arts learning in elementary schools underutilizes digital media and therefore does not optimally enhance creativity and appreciation. In the context of the Merdeka Curriculum, which emphasizes creative learning, authentic experiences, and technology integration (Kemendikbud, 2017). the developed module responds directly to the gap between curriculum expectations and classroom practice.

At the design stage, the module integrated deep learning principles, chunking strategies, and cognitive load theory to ensure structured and meaningful presentation of content. The use of multimedia elements aligns with (Mayer, 2009), who states that well designed visual and audio materials improve conceptual understanding and reduce cognitive load. Furthermore, the module serves as a pedagogical model for prospective teachers, supporting the development of their TPACK competencies, as highlighted by (Widaningsih et al., 2023; Wiguna et al., 2024; Silvester et al., 2024).

During the development stage, expert and teacher validations indicated that the module met excellent feasibility standards. Expert validators rated the module at 90.39 percent, while teachers gave a score of 91.88 percent, both categorized as Excellent. High scores in the didactic and construction aspects confirm alignment with SBdP competencies, and the highest score in the linguistic aspect, 94.00 percent, shows that the material is clear and easy to understand. These findings are consistent with Khoirunnisaa et al (2025) who emphasize the importance of language and presentation quality in digital media implementation, and with Arsyad (2016) who highlights content suitability, clarity, and visual effectiveness as key indicators of quality learning media.

At the implementation stage, the module was positively received by students and teachers. The one-to-one test showed a Very Good rating of 86.25 percent, and classroom practicality scores reached 82.83 percent at SD 182 and 92.66 percent at SD 08. Although differences between schools may relate to variations in digital readiness and learning environment conditions, as noted by Pratiwi & Indana (2022). Overall, responses were highly positive, particularly in content relevance, 93.55 percent. Teacher evaluations further supported these results, with most teachers rating the module Very Good. These findings reinforce previous studies by (Sugianto et al., 2013; Degner et al., 2022; Lieberman et al., 2009), which concludes that interactive digital media enhances participation and clarifies abstract concepts in classroom learning.

The evaluation stage confirms that the digital-based interactive module effectively improves student learning outcomes, as shown by significant pretest and posttest differences in both schools. The consistent improvement across contexts indicates that the module is adaptable and reliable for SBdP learning. These findings support Zuhro et al (2025), who state that digital media enhances engagement and understanding of visual concepts in arts education. Thus, the module strengthens artistic exploration and visual appreciation in elementary SBdP learning. Overall, the findings of this study demonstrate that digital-based interactive teaching modules possess high levels of validity, practicality, and effectiveness in SBdP learning.

The implications of this research extend to the future of art education in Indonesia. By integrating structured multimedia design grounded in contemporary pedagogical principles, this study supports the transformation of arts instruction from predominantly conventional practice-based approaches toward more adaptive, technology-enhanced, and student-centered learning environments. The developed module model provides a scalable framework that can be replicated and adapted across other arts subjects and educational levels. In the long term, this innovation contributes to strengthening digital literacy within arts education while preserving creativity, cultural expression, and contextual learning values that are central to Indonesian elementary education. Thus, this research offers both pedagogical direction and practical solutions for advancing more relevant, inclusive, and future-oriented art education in Indonesia.

Conclusion

This study demonstrates that the development of a digital-based interactive teaching module for prospective teachers functions effectively as an SBdP learning supplement in elementary education. The findings confirm that the module is pedagogically valid, practical for classroom implementation, and effective in improving elementary students' learning outcomes. Beyond improving learning outcomes, the module promotes a richer, multisensory learning experience that supports creativity, artistic exploration, and active student engagement. By integrating structured multimedia design with clear instructional guidance, the module encourages deeper conceptual understanding while maintaining the expressive and practical nature of arts education. Overall, this research highlights the strategic role of digital innovation in strengthening the quality of art education in Indonesia. The developed module offers a scalable and replicable model for integrating technology into SBdP instruction, contributing to the advancement of more adaptive, creative, and future-oriented elementary arts learning environments.

Recommendation

The findings suggest that teachers should integrate digital-based interactive modules as complementary resources in SBdP learning to enhance conceptual understanding and student creativity. Teachers are encouraged to maximize multimedia features and adapt the content to local contexts to maintain relevance in arts education. Future research should involve broader participants, examine impacts on variables such as motivation and creativity, and develop mobile-compatible versions to improve accessibility and sustainability of digital arts learning innovation.

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