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Development of Minangkabau Embroidery Learning Model Based on Local Wisdom to Enhance Student Creativity and Cultural Preservation Literacy

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ABSTRACT

This study aimed to develop and evaluate Minangkabau embroidery learning model based on local wisdom that integrates cultural understanding, technical skills, design development, and reflection on cultural preservation. The study employed a research and development (R&D) approach using the 4D model: define, design, develop, and disseminate. The learning trial involved 30 students in the Fashion Design Study Program at Universitas Negeri Padang. Data were collected through expert validation, a practicality questionnaire, product assessment, and pre- and post-learning measures of creativity and cultural preservation literacy. Analyses included Aiken's V, the practicality percentage, product-quality scores, paired-samples t-tests, and Cohen's dz for paired data. The model obtained an Aiken's V of 0.89, a practicality score of 87.6%, and a product-quality score of 82.4 out of 100. Mean creativity scores increased from 63.4 to 75.2, while cultural preservation literacy scores increased from 66.2 to 78.9. Both changes were statistically significant and had large effect sizes. These findings indicate positive validation and practicality results, accompanied by score improvements in the participating group. Because the evaluation used a single group without a comparison group, the observed changes cannot be attributed exclusively to the model. The model's contribution lies in integrating cultural-source exploration, technical practice, creative design, artisan feedback, and ethical reflection.

Keywords: Minangkabau Embroidery, Local Wisdom, Student Creativity, Cultural Preservation Literacy, Learning Model

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INTRODUCTION

Local culture provides a valuable source of knowledge for enriching higher education. Cultural heritage consists not only of artefacts and symbols but also of skills, production techniques, aesthetic values, social functions, and practices through which knowledge is transmitted across generations. UNESCO's Convention for the Safeguarding of the Intangible Cultural Heritage identifies traditional craftsmanship as one domain of intangible cultural heritage and emphasizes the importance of identification, documentation, safeguarding, and transmission through education and community participation (UNESCO, 2003). UNESCO's framework for culture and arts education likewise emphasizes contextual learning that values cultural diversity (UNESCO, 2024).

In West Sumatra, Minangkabau embroidery is a craft practice that connects hand skills, decorative motifs, product functions, and cultural identity. Prihatin (2022) documented

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traditional hand-embroidery skills among women in Nagari Koto Gadang, including embroidery, terawang, kapalo samek, and suji cair techniques. Yuliarma & Sari (2023) examined the aesthetic value of gold-thread embroidery motifs and the function of banta gadang in Minangkabau wedding settings. Studies on design development also indicate that embroidery motifs can be adapted for contemporary products without abandoning their traditional character, provided that development takes the sources and cultural contexts into account (Malik et al., 2025; Ranelis et al., 2024; Ranelis & Malik, 2018).

Previous studies have examined the development of Minangkabau embroidery learning and design. For example, (Oktaviani & Yulastri, 2020; Oktaviani et al., 2026) developed an instructional model to support students in producing innovative embroidery designs relevant to industry needs. This work provides an important foundation for embroidery instruction while also indicating the need for subsequent studies to define their distinct contributions explicitly. The present study does not claim that developing an embroidery learning model is entirely new. Rather, it extends the instructional focus by explicitly connecting design creativity with cultural preservation literacy.

In art and design education, creativity can be understood as the ability to produce ideas or products that are both novel and appropriate to a particular purpose or context (Runco & Jaeger, 2012). Creativity in embroidery therefore does not necessarily require abandoning traditional patterns. It may emerge through experimentation with composition, colour, product function, or design adaptations that can be justified through an understanding of cultural sources. Kaufman & Beghetto (2009) explain that creativity develops across different levels of experience, from everyday creativity in learning to more mature professional creativity.

Creativity development is also influenced by domain-related skills, motivation, experience, and the social learning environment (Hennessey & Amabile, 2010). Consequently, artwork should not be assessed solely according to a rater's personal aesthetic preferences. Amabile (1982) proposed the consensual assessment technique, which emphasizes judgements made by evaluators with relevant expertise when assessing creative products. In embroidery learning, assessment should consider originality, workmanship, composition, functional suitability, and the accuracy of cultural contextualization.

Learning that combines direct experience with interaction with cultural knowledge holders may enrich this process. Experiential learning connects experience, reflection, the development of understanding, and further experimentation (Kolb & Kolb, 2005). The community-of-practice perspective similarly emphasizes that knowledge is learned through participation in social practices, not solely through the transmission of information (Lave & Wenger, 1991; Wenger, 1998). Artisans can therefore serve as learning partners who demonstrate techniques, explain the cultural context of motifs, and provide feedback on students' work.

Nevertheless, incorporating local wisdom into learning requires more than using traditional motifs as visual decoration. Students need to investigate the sources of information, social functions, and contexts of use, as well as their responsibilities when adapting cultural knowledge. In this study, cultural preservation literacy is treated as a measurable learning outcome comprising knowledge of motifs and their contexts, the ability to use cultural sources responsibly, and awareness of the transmission of traditional skills. This literacy is not equated

with cultural preservation as a long-term social outcome.

Accordingly, this study aimed to develop and evaluate a local-wisdom-based Minangkabau embroidery learning model for students in the Fashion Design Study Program at Universitas Negeri Padang. Specifically, it evaluated the model's content validity, instructional practicality, embroidery product quality, and changes in creativity and cultural preservation literacy scores before and after learning. The proposed contribution lies in integrating cultural-source exploration, technical practice, creative design development, artisan feedback, and ethical reflection within a coherent learning sequence.

METHODS OF RESEARCH

Research Design and Participants

The study employed a research and development (R&D) approach using the 4D model, consisting of define, design, develop, and disseminate. This model was used to develop instructional materials systematically, evaluate the suitability of the design, make revisions, and prepare the model for implementation. The learning trial involved 30 students in the Fashion Design Study Program at Universitas Negeri Padang. Changes in learning outcomes were evaluated by comparing students' scores before and after the learning activities. Thus, the outcome evaluation within the development study used a single-group pretest–posttest design.

Development Procedure

The define stage identified instructional needs, student characteristics, relevant embroidery skills, and sources of cultural knowledge. The analysis drew on a literature review, examination of learning materials, and information about techniques, decorative motifs, product functions, and the transmission of embroidery skills. This stage provided the basis for determining learning outcomes and the scope of the instructional content.

The design stage produced the learning-model framework, instructional module, student worksheets, creativity and product-assessment rubrics, and cultural preservation literacy instrument. Activities were structured so that students would not merely copy patterns, but would also document motif sources, generate design alternatives, justify their design choices, and reflect on the relationship between their work and its cultural context.

The develop stage included expert review, revision of instructional materials, implementation of the learning activities, and evaluation of practicality and learning outcomes. Expert review considered the accuracy of cultural content and embroidery techniques, the coherence of learning activities, the clarity of instructions, and the appropriateness of assessment. Feedback from artisans was used to review cultural contextualization and provide input on students' processes and products.

During the disseminate stage, the final instructional materials, process documentation, student portfolios, and implementation guide were prepared and shared at the study-program level. Dissemination followed revisions based on evaluation findings and represented an initial step toward applying the model in relevant instructional settings.

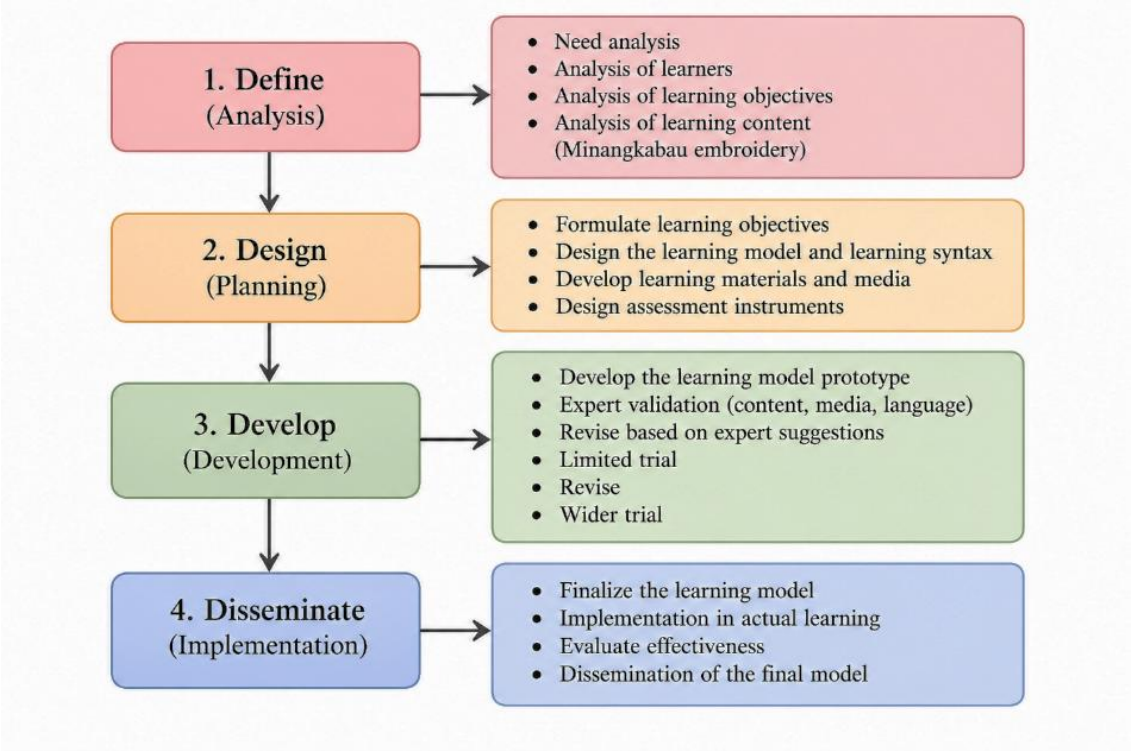

Figure 1 Development Procedure

Instruments and Data Collection

Data were collected using an expert-validation form, a creativity assessment rubric, a cultural preservation literacy instrument, a practicality questionnaire, and a product-quality rubric. Creativity was assessed through four dimensions: fluency, flexibility, originality, and elaboration. The accompanying assessment framework specifies a five-point rating scale for each dimension, with a maximum raw score of 20, which can be converted to a standardized score ranging from 0 to 100.

Cultural preservation literacy was operationalized through four dimensions: knowledge of traditional decorative motifs, understanding of cultural contexts, responsible use of cultural sources, and awareness of traditional skill transmission. The accompanying instrument comprises 16 assessment items, each scored from 0 to 4, resulting in a maximum raw score of 64. Scores can be converted to a 0–100 scale to facilitate interpretation.

Product quality was evaluated based on technical execution, composition, finishing, design originality, and cultural appropriateness. The practicality questionnaire addressed ease of implementation, clarity of instructions, adequacy of learning time, and availability of supporting facilities. The learning trial involved 30 students from the Fashion Design Study Program at Universitas Negeri Padang.

The newly specified instruments and scoring procedures provide a framework for standardized assessment. However, the available research records do not establish whether these exact scoring procedures were used during the original trial. Item-level responses and individual rater scores were not available for independent reliability analysis. Consequently, Cronbach's alpha and inter-rater reliability coefficients are not reported. The number and

qualifications of the original assessors, their awareness of the assessment stage, and the final number of completed practicality questionnaires also require verification against the original research documentation. Aiken's V was used to evaluate content validity and should not be interpreted as evidence of instrument reliability.

Table 1 Instruments and Assessment Dimensions

Instrument	Main assessment dimensions	Data/analysis
Expert-validation form	Accuracy of cultural and technical content; coherence of activities; clarity of instructions; suitability of assessment	Aiken's V coefficient
Creativity rubric	Fluency, flexibility, originality, elaboration	Pre- and post-learning scores
Cultural preservation literacy instrument	Knowledge of motifs; cultural context; responsible use of sources; awareness of transmission	Pre- and post-learning scores
Practicality questionnaire	Ease of use, clarity of instructions, adequacy of time, supporting facilities	Practicality percentage
Product-quality rubric	Technical quality, composition, finishing, novelty, cultural appropriateness	Product score on a 0–100 scale

Data Analysis

Content validity was analysed using Aiken's V, taking into account expert ratings, the lowest score on the rating scale, the number of response categories, and the number of raters (Aiken, 1985). The validation involved three expert validators who assessed 20 items using a five-point Likert scale ranging from 1 (very inappropriate) to 5 (very appropriate). The resulting Aiken's V coefficient was 0.89, indicating a high level of content validity for the developed learning model.

Practicality was calculated as the percentage of the obtained score relative to the maximum possible score. Product quality was reported as a mean score on a 0–100 scale. Changes in creativity and cultural preservation literacy were analysed using paired-samples t-tests. Effect sizes were calculated using Cohen's dz for paired data, defined as the mean difference divided by the standard deviation of the difference scores. The 95% confidence interval for each mean difference was also calculated to provide an estimate of the magnitude and precision of the observed changes. The paired-samples t-test assumes that the difference scores are approximately normally distributed and that observations are independent across participants.

Quantitative findings were interpreted alongside the characteristics of the developed learning model and evidence from students' learning products. Because learning outcomes were evaluated using a single-group pretest–posttest design without a comparison group, the analysis focused on observed changes among participants rather than making definitive causal claims about the effectiveness of the model.

RESULTS AND DISCUSSION

The Developed Learning Model

The development process produced a learning model that connects cultural knowledge, technical skills, design creation, and reflection on cultural preservation. Students are

positioned as active learners who examine cultural sources, explore motifs, practise techniques, develop design alternatives, create prototypes, receive feedback, and explain their design decisions. Artisans serve as learning partners who explain techniques and cultural contexts, while lecturers guide learning outcomes and ensure that assessment follows explicit criteria.

Table 2 Stages of the Minangkabau Embroidery Learning Model

Learning stage	Main student activities	Learning outputs/evidence
1. Cultural orientation	Observe embroidery products and examine their contexts of use and cultural functions.	Initial notes and questions about Minangkabau embroidery.
2. Motif exploration	Identify motif forms, functions, and information sources; record verifiable sources.	Motif documentation sheet and sources.
3. Technical practice	Learn and practise embroidery techniques through demonstrations and staged exercises.	Samples of technique practice.
4. Design development	Generate alternatives, compare options, and explain the rationale for the selected design.	Alternative sketches and design rationale.
5. Production, feedback, and reflection	Create a prototype, receive feedback from lecturers/artisans, revise the work, and reflect on its relationship to tradition.	Embroidery product, portfolio, and cultural reflection.

The five stages form an interconnected learning sequence. Cultural exploration provides a basis for design decisions, technical practice enables students to translate ideas into products, and feedback and reflection help students evaluate both the quality of their work and their responsibility toward cultural sources.

Model Validity, Practicality, and Product Quality

The evaluation produced an Aiken's V content-validity coefficient of 0.89. The instructional practicality score was 87.6%, obtained from questionnaires completed by 30 students participating in the learning trial, while the mean quality score for embroidery products was 82.4 out of 100. These findings indicate a high level of content validity, positive student perceptions of instructional practicality, and satisfactory quality of the embroidery products developed during the trial. Collectively, the results provide preliminary evidence supporting the suitability and feasibility of the developed Minangkabau embroidery learning model within the study context.

Table 3 Summary of Model Evaluation Results

Evaluation component	Result	Interpretation
Model content validity (Aiken's V)	0.89	Indicates a high content-validity rating based on expert assessments.
Instructional practicality	87.6%	Indicates a positive practicality response in the trial.
Embroidery product quality	82.4/100	Product-quality score on a 0–100 scale.

The validity, practicality, and product-quality values should be interpreted in relation to the instruments and assessment criteria used. They provide evidence about the instructional design and products, but do not by themselves establish that the model will produce similar results in other student groups, courses, or institutions.

Changes in Creativity and Cultural Preservation Literacy Scores

The mean student creativity score increased from 63.4 (SD = 8.7) before learning to 75.2 (SD = 8.2) after learning, a mean difference of 11.8 points. The mean cultural preservation literacy score increased from 66.2 (SD = 9.1) to 78.9 (SD = 7.7), a mean difference of 12.7 points. Descriptive statistics are presented in Table 4.

Table 4 Pre- and Post-Learning Scores (N = 30)

Variable	Pre-learning, M (SD)	Post-learning, M (SD)	Mean difference	SD of differences
Student creativity	63.4 (8.7)	75.2 (8.2)	11.8	9.5
Cultural preservation literacy	66.2 (9.1)	78.9 (7.7)	12.7	9.8

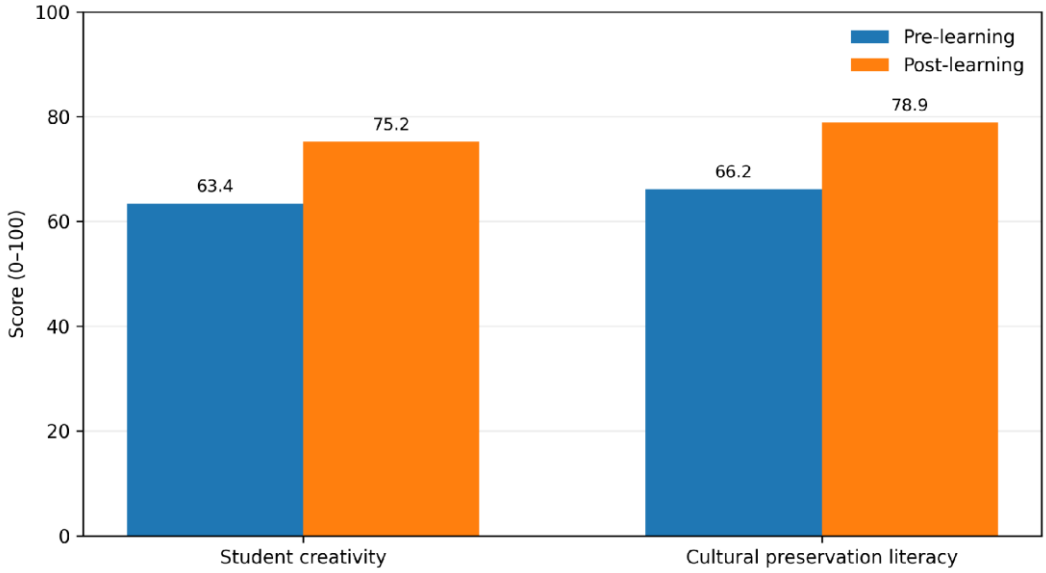

Figure 2 Comparison of Mean Scores Before and After Learning

Paired-samples t-tests indicated statistically significant changes in both variables. For creativity, the result was $t(29) = 6.80$, $p < .001$, with $dz = 1.24$ and a 95% confidence interval for the mean difference of 8.25–15.35. For cultural preservation literacy, the result was $t(29) = 7.09$, $p < .001$, with $dz = 1.30$ and a 95% confidence interval of 9.04–16.36. These effect sizes

indicate that the observed mean changes were large relative to the variability in difference scores in the group studied.

Table 5 Paired-Samples T-Test Results and Effect Sizes

Variable	t(df)	p	Cohen's dz	95% CI for mean difference
Student creativity	6.80 (29)	<.001	1.24	8.25–15.35
Cultural preservation literacy	7.09 (29)	<.001	1.30	9.04–16.36

These results indicate that scores increased after students participated in the learning activities. However, a single-group design cannot rule out alternative explanations, such as practice effects, other learning experiences, repeated testing, regression to the mean, or novelty and enthusiasm effects from taking part in a newly designed, culturally distinctive course. The statistical findings are therefore interpreted as observed changes in the trial group rather than definitive causal evidence.

Learning Outputs

The model produced four learning outputs: (1) a portfolio documenting motifs and information sources; (2) samples of embroidery techniques; (3) embroidery products based on developed designs; and (4) written reflections on sources of inspiration, design decisions, artisans' contributions, and ways to maintain a connection between the work and tradition. These outputs allow the learning process and final products to be assessed together. Achievement is therefore evaluated not only through the final product but also through information gathering, the development of alternatives, response to feedback, and justification of design decisions.

Validity and Practicality of the Learning Model

The Aiken's V value of 0.89 indicates that the model content received positive ratings from the experts involved. This finding supports the content suitability of the instructional materials for use in the trial, particularly because cultural content, technical practice, design activities, and assessment were developed as an integrated sequence. Nevertheless, interpretation of validity should take account of the number and expertise of the raters, the number of assessed items, the rating scale, and the revisions made after review. Reporting these details enables readers to judge the strength of the validation evidence more accurately.

The practicality score of 87.6% suggests that the materials were viewed positively in the trial context, while the product-quality score of 82.4/100 describes the students' work. These results are consistent with an approach to instructional development that considers not only content completeness but also usability and the quality of learning outputs. However, evidence from one context is insufficient to conclude that the model will be equally practical in every class. Equipment availability, time for practice, students' prior skills, and access to artisans may influence implementation.

Embroidery Learning and Creativity Development

The 11.8-point increase in creativity, accompanied by an effect size of dz = 1.24, indicates a substantial change in the trial group. Pedagogically, a sequence that asks students to generate alternatives, justify design choices, create prototypes, and revise their work provides opportunities to practise fluency, flexibility, originality, and elaboration. This

approach is consistent with Runco & Jaeger (2012) view that creativity requires both novelty and appropriateness, and with Scott et al. (2004) review suggesting that creativity training is more promising when it uses structured exercises relevant to the field of application.

The findings also highlight the importance of a learning environment that supports exploration and feedback. Hennessey & Amabile (2010) identify the social environment as one factor interacting with individual abilities in creative processes. In embroidery learning, feedback from lecturers and artisans can help students improve their technique and assess whether design changes are well justified. Rubric-based assessment can also reduce the risk of defining creativity merely as a rater's personal preference for particular colours or motifs.

The findings should be compared carefully with previous research. Oktaviani & Yulastri (2020) and Oktaviani et al. (2026) had already developed an instructional model to support innovative Minangkabau embroidery. In contrast, Prihatin (2022) and Yuliarma & Sari (2023) examined embroidery skills and the aesthetic and functional values of motifs; these studies inform the cultural content of the present model but are not instructional-model development studies. Accordingly, the contribution of the present study is not a claim to be the first such model, but its explicit emphasis on cultural preservation literacy and responsible use of cultural sources, integrated with creative design activities. This distinction should remain clear in subsequent writing and model development.

Cultural Preservation Literacy and Partnerships with Artisans

The 12.7-point increase in cultural preservation literacy indicates that the measured knowledge and understanding scores were higher after learning than before it. Integrating motif documentation, discussion of product functions, source recording, and design reflection may help students understand that motifs are not merely decorative elements. This approach is relevant to Prihatin (2022) documentation of traditional embroidery skills in Koto Gadang and Yuliarma & Sari (2023) analysis of the aesthetic value and function of banta gadang.

Artisan involvement has pedagogical value because technical knowledge and cultural context can be learned through demonstration and dialogue, rather than only through texts or images. This is consistent with experiential learning theory Kolb & Kolb (2005) and the community-of-practice perspective Lave & Wenger (1991). Artisans should therefore be recognized not merely as providers of product examples but as knowledge holders whose contributions deserve acknowledgement. Recording sources and establishing agreements about the use of cultural knowledge are important elements of responsible learning.

Although literacy scores increased, this result should not be equated directly with long-term success in cultural preservation. Literacy is one factor that may support preservation, but the continuity of a tradition also depends on skill transmission, the sustainability of artisan communities, economic opportunities, and the use of craft products in social life. Research on artisan regeneration likewise treats the continuity of local skills as a matter of knowledge transmission and creativity (Nurcahyanti et al., 2021). Future studies should examine whether students retain their knowledge and attitudes after the course and whether they participate in documentation or skill-transmission activities.

Implications for Higher Education

The model has three practical implications. First, art and design learning can combine

technical mastery with investigation of cultural context and ethical reflection. Second, partnerships with artisans can strengthen the relationship between universities and cultural communities when artisan contributions are acknowledged and collaboration is agreed upon transparently. Third, assessment should address both process and product through portfolios, creativity rubrics, technical quality, source documentation, and student reflection. These implications align with UNESCO's call to embed culture and the arts in contextual learning (UNESCO, 2024).

At the curriculum-development level, the model may be adapted for craft, textile design, or project-based learning courses. Adaptation should consider the characteristics of the local tradition, students' capabilities, practice time, and the consent of knowledge-holding communities. The model should not assume that all motifs can be modified freely; design decisions should be accompanied by explanations of sources, functions, and acceptable boundaries for adaptation.

Study Limitations

This study has several limitations. First, changes in learning outcomes were evaluated in a single group of 30 students without a comparison group. Pre- to post-learning gains may also reflect practice effects, regression to the mean, and novelty or enthusiasm effects from taking part in a newly designed course. Therefore, the score changes do not establish a definitive causal relationship. Second, measurement was conducted before and after learning, so the durability of the changes remains unknown. Third, cultural preservation literacy is a learning-outcome indicator, not a direct measure of the long-term sustainability of a tradition or its social impact on artisan communities. Fourth, generalization should be cautious because the trial was limited to one study program. Fifth, the cultural preservation literacy instrument was developed for this study and was not compared with an established related measure, so convergent-validity evidence is not yet available.

Future research should include a comparison group or quasi-experimental design, follow-up measurements, reporting of instrument reliability and inter-rater agreement, convergent validation of the cultural preservation literacy instrument against an established related measure, and qualitative data from interviews with students and artisans. Evaluation should also document implementation fidelity at each stage, the intensity of artisan involvement, and changes in product quality over time.

CONCLUSIONS

This study produced a local-wisdom-based Minangkabau embroidery learning model integrating cultural orientation, motif exploration, technical practice, design development, production, and reflection. The model obtained an Aiken's V of 0.89, a practicality score of 87.6%, and a product-quality score of 82.4 out of 100. In the trial group of 30 students, mean creativity scores increased from 63.4 to 75.2, while cultural preservation literacy scores increased from 66.2 to 78.9. Both changes were statistically significant and had large effect sizes. The findings support the potential of the model to connect creativity development with cultural understanding in embroidery learning. Its main contribution is the integration of technical practice and creative design with source documentation, artisan feedback, and reflection on cultural responsibility. However, because learning outcomes were evaluated in a

single group without a comparison group, the findings should not be treated as definitive causal evidence. Further testing using comparative designs, long-term measurements, and instrument-reliability reporting is required before the model is implemented more widely.

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PARTICIPANT CONSENT

This research was conducted based on informed consent from all participants. Participants received an explanation of the purpose and procedures of the research, its potential risks and benefits, and their right to withdraw from participation at any time without consequence. Written consent was obtained from all participants before data collection.

CONFLICT OF INTEREST

The authors declare no conflict of interest related to the conduct, analysis, interpretation, or publication of this research.

AUTHOR CONTRIBUTIONS

V.O. contributed to the conceptualization of the research, development of the learning model, research methodology, data collection, and preparation of the original manuscript. R.H. contributed to the development of the theoretical framework, refinement of the research methodology, data analysis, and interpretation of the findings. W.N. contributed to the instructional design, integration of Minangkabau cultural knowledge into the learning model, and critical revision of the manuscript. S.Z.N. contributed to research supervision, evaluation of the learning model, critical review, and editing of the manuscript. All authors contributed to the review and finalization of the manuscript and confirm that they have read and approved the final version. The percentage contributions to the conceptualization, drafting, and revision of this paper are as follows: V.O.: 35%, R.H.: 25%, W.N.: 20%, and S.Z.N.: 20%, totaling 100%.

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