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Repurposed Shuttlecocks as Cultural Learning Media: Enhancing Traditional Clothing Recognition in Early Childhood Education

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Abstract:
The declining familiarity of young children with traditional Indonesian clothing highlights the need for innovative and engaging cultural learning media in early childhood education. Using recycled materials as learning resources offers an alternative approach to introducing cultural heritage while promoting creativity and environmental awareness. This study aimed to examine the effectiveness of educational media made from used badminton shuttlecocks and transformed into dolls wearing traditional clothing from Papua, Bali, and Betawi in improving Group B children's ability to recognise Indonesian regional traditional attire. This study employed a quantitative approach using a one-group pretest-posttest design involving 20 children. Data were collected through oral assessments administered before and after the intervention. The results were analysed to identify improvements in children's recognition abilities and learning gains. The findings demonstrated a significant improvement in children's ability to identify traditional clothing, accompanied by more consistent recognition and reduced performance differences among learners. These findings suggest that recycled badminton shuttlecocks can serve as an affordable, practical, and engaging learning medium for introducing cultural diversity and strengthening cultural awareness in early childhood education, particularly in settings with limited learning resources.

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INTRODUCTION

Indonesia’s cultural diversity is sustained not only through language, rituals, and artistic practices but also through visible expressions such as traditional clothing. These garments communicate regional histories, values, social roles, and collective identity; therefore, children’s familiarity with them matters beyond the ability to name an outfit. When cultural knowledge is not introduced meaningfully during childhood, opportunities to recognise and appreciate local heritage may weaken across generations. Research on cultural identity and education emphasises the importance of learning experiences that connect children with culturally meaningful practices and symbols (Shih, 2022; Ullah & Ho, 2021; Awaliah et al., 2025). Indonesian studies likewise highlight the educational value of local wisdom in early childhood learning and character development (Abubakar & Uke, 2021; Nurani et al., 2024; Azizah & Octarina, 2025). Thus, introducing traditional clothing through developmentally appropriate activities is a practical contribution to cultural continuity, social cohesion, and children’s sense of belonging.

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The study adopts a sociocultural view: children develop knowledge through interaction with meaningful cultural tools, people, and practices. From this perspective, traditional clothing is not simply an object to memorise; it is a cultural artefact through which children can encounter symbols of community identity. Research on culturally responsive preschool curricula shows that learning experiences connected to local culture can support the development of young children's cultural identities (Shih, 2022; Furqon et al., 2026). The study also draws on play-based learning theory, which positions active exploration and purposeful play as important contexts for children's learning and development (Samuelsson & Björklund, 2023; Skene et al., 2022; Yulis, 2025). Physical manipulatives may further support learning by making ideas tangible and available for direct exploration (Byrne et al., 2023). These perspectives inform shuttlecock dolls as cultural learning media and recognition as the outcome variable during meaningful everyday classroom interactions.

A challenge in early childhood education is that cultural topics may be presented through explanations or pictures without sufficient opportunities to explore cultural objects (Candra, 2025; Nazwa et al., 2025). Such approaches can make it difficult for young learners to distinguish regional clothing and connect its appearance with a particular cultural community. Research in Indonesian early childhood settings has identified the importance of integrating local wisdom into learning, character education, and play-centre activities (Sakti et al., 2024; Nurani et al., 2024; Ulfa & Aldin, 2026). Studies focusing specifically on traditional clothing also indicate that cultural content can be introduced to young children through planned learning experiences (Kurniati et al., 2021). However, teachers may face practical constraints when selecting media that are affordable, easy to prepare, engaging, and suitable for repeated use. This calls for accessible resources combining cultural representation with child participation in many culturally diverse early learning communities today.

Previous studies have explored several ways to strengthen cultural learning in early childhood. Abubakar and Uke (2021) examined the integration of coastal community local wisdom into early childhood learning, while Kurniati et al. (2021) focused on teaching the local wisdom of traditional Buton clothing. Shih (2022) demonstrated the relevance of a preschool local-culture curriculum for cultivating children's cultural identities. Other research has considered character education through ethnopedagogy and local wisdom (Sakti et al., 2024), as well as children's character learning in play-centre settings (Nurani et al., 2024). Together, these studies establish that local culture can be meaningfully incorporated into early childhood education. Nevertheless, their primary emphasis is on curriculum, pedagogical approaches, or broader cultural learning rather than on a low-cost, child-manipulable artefact made from reused everyday materials to teach recognition of specific regional clothing for teachers' everyday material design choices.

Research on play and learning provides further support for designing hands-on cultural activities. Systematic and meta-analytic evidence indicates that guidance during play can enhance children's learning and development, while pretend play is associated with social competence and opportunities to practise self-regulation (Smits-van der Nat et al., 2024; Brėdikytė, 2023; Dewi et al., 2026). Research has also examined the role of physical manipulatives in children's learning (Byrne et al., 2023) and compared physical and virtual manipulatives in preschool science learning (Pavlou et al., 2024). These

contributions clarify the potential of play and tangible materials, but they do not directly address the use of recycled shuttlecocks as dolls representing Papua, Bali, and Betawi attire. The present study therefore connects two strands of literature—culturally responsive education and hands-on playful learning—within a focused intervention on regional clothing recognition in early childhood for young learners.

The novelty of this study lies in transforming used badminton shuttlecocks into small dolls dressed in traditional clothing from Papua, Bali, and Betawi, and using these artefacts as a hands-on medium for cultural recognition. Rather than relying on digital devices, printed images, or commercially produced teaching aids, the intervention turns an inexpensive discarded material into a tangible representation that children can observe, handle, compare, and discuss. This design links cultural introduction with reuse and play-based participation. It is intended to make regional clothing more concrete and memorable while remaining feasible for teachers working with limited resources. The study also evaluates the medium through children's performance before and after its use, rather than describing the product alone. In this way, the research offers a practical and assessable model for integrating cultural learning, material reuse, and active participation in early childhood classrooms.

This study addresses the following research problem: can learning media made from used badminton shuttlecocks and designed as dolls wearing traditional clothing improve Group B children's ability to recognise regional Indonesian attire? It examines recognition before and after the intervention and tests whether the observed change is statistically significant. The working argument is that children will demonstrate better recognition after learning with the shuttlecock dolls because the medium provides visible, concrete, and manipulable representations that can be explored through guided play and discussion. Its contribution is twofold. Practically, the study provides teachers with an affordable alternative for introducing cultural diversity without requiring digital infrastructure. Academically, it adds intervention-based evidence about the use of recycled physical media for cultural learning in early childhood education. Findings may inform locally relevant resources supporting cultural awareness through accessible classroom experiences and future instructional planning.

RESEARCH METHOD

This study employed a quantitative pre-experimental design using a one-group pretest-posttest approach to examine changes in children's ability to recognise traditional Indonesian clothing following an educational intervention. This design was selected because it enables the measurement of differences in participants' performance before and after the implementation of a learning intervention within the same group. The approach is suitable for examining preliminary changes in educational outcomes, although the absence of a control group limits the ability to establish causal relationships (Spurlock, 2018). The intervention involved educational dolls made from used badminton shuttlecocks and dressed in traditional clothing representing Papua, Bali, and Betawi. Children's recognition abilities were measured through pretest and posttest assessments.

The study was conducted at KB Permata Suket Duwur, Cirebon, West Java, Indonesia, from April 9 to June 25, 2025. The research location was selected based on preliminary observations indicating that several children experienced difficulties recognising Indonesian traditional clothing independently. The institution also provided a relevant educational setting for implementing affordable, recycled-material-based

learning media through developmentally appropriate activities. The intervention was designed to address the identified learning needs by introducing cultural knowledge through concrete and interactive educational experiences. The selection of the research setting was therefore based on the observed learning problem and the practical suitability of the institution for implementing the proposed intervention.

The study population consisted of all 20 children enrolled in Group B at the participating early childhood education institution. A saturated sampling technique was employed, whereby all members of the accessible population were included as research participants. This approach was considered appropriate because the entire target group was accessible and could participate in the intervention. Sampling decisions should consider the research objectives, population characteristics, and practical constraints associated with participant selection (Ahmed, 2024). Consequently, the sample comprised 20 children, all of whom received the same educational intervention. Pretest and posttest assessments were administered to the same participants to examine changes in their individual and overall recognition abilities.

Data were collected through preliminary observation, oral performance assessments, and documentation. Preliminary observations were conducted to identify children's initial familiarity with traditional Indonesian clothing. Oral performance assessments served as the primary instrument for measuring children's recognition abilities before and after the intervention. The use of observation and oral examination is consistent with assessment approaches identified in research involving preschool-aged children (Van Elsen et al., 2026). Three indicators were assessed: identifying traditional clothing according to its regional origin, describing its distinguishing characteristics, and explaining its function. Each indicator was scored using four developmental categories: Not Yet Developed (5), Developed as Expected (10), Well Developed (15), and Very Well Developed (20). The maximum individual score was 60. Documentation included learning records and photographs of the intervention activities.

Table 1. Percentage Conversion Scale

Percentage	Category
86–100%	Very High
76–85%	High
60–75%	Moderate
55–59%	Low
<54%	Very Low

Source: Casta (2019, p. 75).

Data were analysed using descriptive and inferential statistics with SPSS version 20.0. Descriptive statistics included the mean, standard deviation, variance, and percentage scores for pretest and posttest performance. The normality assumption was examined based on the distribution of paired difference scores. A paired-samples t-test was used to determine whether the mean difference between pretest and posttest scores was statistically significant at the 0.05 level. The Wilcoxon signed-rank test was considered as a non-parametric alternative when the assumptions for the paired-samples t-test were not satisfied, particularly given the ordinal nature of the assessment categories (Rietveld & van Hout, 2017). Additionally, learning improvement was evaluated using the normalised gain formula proposed by Hake (1998), calculated as the difference between posttest and pretest scores divided by the maximum possible score minus the pretest score.

RESULTS AND DISCUSSION

Results

Pre-Intervention Performance

The pretest results indicated that children's initial ability to recognise traditional Indonesian clothing was relatively limited. As presented in Table 2, the overall mean score was 29.50 out of a maximum of 60, equivalent to 49.00%, which falls within the Very Low category based on the percentage conversion scale. Among the three assessment indicators, describing distinguishing features obtained the highest percentage (51.25%), followed by stating the function of traditional clothing (48.75%) and identifying clothing according to regional origin (47.50%). The descriptive statistics showed a standard deviation of 11.80 and a variance of 139.21, indicating considerable variation in children's initial scores.

Table 2. Pre-Intervention Performance by Indicator (n = 20)

Indicator	Total Score	Mean	Percentage
Naming traditional clothing by region	190	9.50	47.50%
Describing distinguishing features	205	10.25	51.25%
Stating the function of traditional clothing	195	9.75	48.75%
Class total / mean	**590**	**29.50**	**49.00%**

These findings indicate that children's initial recognition was limited across all three assessment dimensions. The relatively low percentage for identifying clothing by regional origin suggests that associating visual representations with specific cultural regions was particularly challenging. The variation in individual scores also indicates that children entered the intervention with different levels of prior knowledge. However, the available descriptive statistics do not establish the factors responsible for these differences.

Post-Intervention Performance and Learning Gain

Following the implementation of shuttlecock-based learning media, children's posttest performance increased across all three assessment indicators. As shown in Table 3, the overall mean score increased to 53.25 out of 60, corresponding to 88.75%, which is classified as Very High. Describing distinguishing features remained the highest-performing indicator (92.50%), followed by stating the function of traditional clothing (87.50%) and identifying clothing according to regional origin (86.25%). The posttest standard deviation decreased to 6.34, with a variance of 40.20.

Table 3. Post-Intervention Performance by Indicator (n = 20)

Indicator	Total Score	Mean	Percentage
Naming traditional clothing by region	345	17.25	86.25%
Describing distinguishing features	370	18.50	92.50%
Stating the function of traditional clothing	350	17.50	87.50%
Class total / mean	**1,065**	**53.25**	**88.75%**

The difference between the pretest and posttest means was 23.75 points. The corresponding percentage-point increase was 39.75, from 49.00% to 88.75%. Based on the reported group means, the normalised gain was calculated as follows:

$$g = \frac{53.25 - 29.50}{60 - 29.50}$$

$$g = \frac{23.75}{30.50} = 0{,}78$$

The resulting N-Gain of approximately 0.78 falls within the high category. This indicates substantial improvement in the group's performance relative to the maximum possible improvement. Nevertheless, the N-Gain value represents a descriptive measure of learning improvement and does not independently establish the statistical significance or causal effectiveness of the intervention.

Statistical Analysis

The normality test results are presented in Table 4. The Kolmogorov–Smirnov test produced an Asymp. Sig. value of .235 for the pretest and .587 for the posttest. Both values exceeded the .05 significance threshold, indicating that the tests did not provide sufficient evidence to reject the normality assumption for either set of scores.

Table 4. Normality Test Results (Kolmogorov–Smirnov)

Variable	Asymp. Sig. (2-tailed)	Threshold	Result
X1 (Pretest)	.235	.05	Normal
X2 (Posttest)	.587	.05	Normal

The homogeneity test results are reported in Table 5. Levene's test produced a statistic of .858, with df1 = 4, df2 = 14, and a significance value of .512. Since the significance value exceeded .05, the test did not indicate statistically significant differences in the variances of the groups included in that analysis.

Table 5. Homogeneity Test Results (Levene's Test)

Levene Statistic	df1	df2	Sig.	Result
.858	4	14	.512	Not significant

The paired-samples t-test was conducted to examine the difference between pretest and posttest scores. As presented in Table 6, the analysis yielded a t-value of -7.841, with 19 degrees of freedom and a mean difference of -23.75 for the comparison calculated as pretest minus posttest. The reported significance value of .000 should be expressed as $p < .001$. This result indicates a statistically significant difference between children's pre-intervention and post-intervention scores.

Table 6. Paired-Samples t-Test Results

Condition	t	df	Sig. (2-tailed)	Mean Difference
Paired differences (X1 – X2)	-7.841	19	< .001	-23.75

Note. df = n – 1 = 19. The negative mean difference reflects higher posttest than pretest scores.

The statistical findings demonstrate that children's performance after the intervention was significantly higher than their initial performance. The null hypothesis of no mean difference was therefore rejected. However, because the study employed a one-group pretest-posttest design without a control group, the results establish an association between the intervention period and improved performance rather than definitive evidence that the media alone caused the improvement.

Discussion

The findings demonstrate that the use of educational media made from recycled badminton shuttlecocks was associated with improved children's ability to recognise traditional Indonesian clothing. This result supports Shih (2022), who emphasised that culturally responsive preschool curricula contribute to the development of children's cultural identities. Similarly, Nurani et al. (2024) demonstrated the relevance of integrating Indonesian local wisdom into early childhood character learning. Kurniati et al. (2021) also highlighted the importance of introducing traditional clothing through local wisdom-based learning. While these previous studies primarily focused on cultural curricula and pedagogical approaches, the present study extends their contributions by demonstrating the application of recycled physical objects as tangible representations of regional clothing. The findings suggest that cultural learning can be supported not only through curriculum integration but also through accessible instructional media that enable children to interact directly with cultural representations.

The improvement observed in this study is also consistent with research highlighting the educational potential of physical manipulatives. Byrne et al. (2023) identified the contribution of physical manipulatives to children's learning and development, particularly through direct interaction with learning materials. Similarly, Pavlou et al. (2024) examined the use of physical and virtual manipulatives in preschool science learning, demonstrating the relevance of comparing different forms of hands-on learning resources. The present study extends these findings to cultural education, a learning domain that was not the primary focus of those investigations. Shuttlecock dolls provide three-dimensional representations that children can observe, touch, dress, and manipulate. Unlike conventional pictures or digital representations, this medium combines physical exploration with culturally specific content. This provides an alternative application of manipulative-based learning for introducing regional cultural heritage in early childhood education.

The findings further reinforce the relationship between play-based learning and children's cultural understanding. The intervention incorporated doll dressing, regional clothing matching, and guided discussions, allowing children to explore cultural representations through active participation. This approach is consistent with Samuelsson and Björklund (2023), who examined the relationship between play and learning, and Skene et al. (2022), whose systematic review and meta-analysis highlighted the potential contribution of adult guidance during play to children's learning and development. Brėdikytė (2023) also emphasised the developmental significance of pretend play from a cultural-historical perspective. The present study contributes to this literature by incorporating traditional clothing into symbolic and imaginative play activities. Rather than treating cultural knowledge as information to be memorised, shuttlecock dolls provide opportunities for children to explore cultural differences through concrete objects and guided interactions.

Differences across the assessment indicators provide additional insights into the learning outcomes. Describing distinguishing clothing features achieved the highest posttest percentage (92.50%), whereas identifying clothing according to regional origin obtained the lowest percentage (86.25%). This pattern suggests that children performed better in describing observable characteristics than in associating clothing with specific geographical origins. Although all indicators reached the Very High category, the difference highlights the importance of combining visual exploration with explicit cultural identification activities. This finding provides a useful extension to Kurniati et al. (2021), who examined the introduction of traditional Buton clothing through local wisdom-based

learning. While their study established the relevance of traditional clothing as educational content, the present findings indicate that identifying regional origins may require additional reinforcement alongside visual recognition. Therefore, future activities could integrate repeated naming, regional matching, and guided conversations into hands-on cultural play.

An additional contribution concerns the accessibility of the learning medium. Previous studies have explored culturally responsive curricula and innovative educational media, including multimedia-based cultural games (Haris et al., 2024) and interactive learning resources for introducing traditional clothing (Kartikaet al., 2024). These approaches demonstrate the potential of engaging media for cultural education. However, the present study offers a different approach by transforming discarded badminton shuttlecocks into dolls representing traditional clothing from Papua, Bali, and Betawi. Its distinctive contribution lies in combining cultural introduction, physical manipulation, and material reuse within a single learning resource. This approach is consistent with Sakti et al. (2024), who highlighted the importance of revitalising local wisdom through ethnopedagogy. The present study extends this perspective by providing an example of how culturally meaningful learning resources can be fabricated from inexpensive recycled materials without requiring digital infrastructure or specialised equipment.

Despite the positive findings, the results should be interpreted within the limitations of the research design. The one-group pretest-posttest design involving 20 children does not establish that the observed improvement was exclusively attributable to the shuttlecock media, as other factors, including repeated assessment and teacher guidance, may have contributed. Furthermore, the study measured children's immediate recognition abilities and did not examine long-term retention or the transfer of cultural understanding to other contexts. Nevertheless, the study contributes empirical evidence on the potential application of recycled physical media in culturally responsive early childhood education. Its novelty lies in the integration of reused badminton shuttlecocks, traditional regional clothing, and guided play as an affordable cultural learning medium. Future research should employ comparative experimental designs, larger participant groups, and delayed assessments to examine the effectiveness, sustainability, and broader applicability of this approach.

CONCLUSION

This study demonstrates that the use of educational media made from recycled badminton shuttlecocks can support the development of young children's ability to recognise traditional Indonesian clothing. The improvement in children's pretest and posttest scores highlights an important lesson: cultural knowledge can be introduced more meaningfully through concrete, interactive, and play-based learning experiences. The implications of these findings suggest that teachers can utilise affordable recycled materials to create engaging learning resources for introducing cultural diversity, particularly in early childhood education settings with limited technological infrastructure. Scientifically, this study contributes to the literature on culturally responsive education by extending the application of physical manipulatives and play-based learning to the introduction of regional cultural identity through traditional clothing. However, the findings should be interpreted cautiously because the study involved only 20 children from one institution and employed a one-group pretest-posttest design without a control group. Furthermore, the study did not assess long-term knowledge retention. Future research should involve larger and more diverse samples,

comparison groups, broader representations of Indonesian traditional clothing, and delayed posttests to establish the effectiveness, generalisability, and sustainability of recycled-material-based cultural learning media.

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