

WOODEN CUBE PUZZLE AS AN EFFORT TO INTRODUCE TRADITIONAL NUSANTARA CLOTHING AND HOUSES

Asidigisianti Surya Patria^{1*}; Martadi²; Nova Kristiana³; Nanda Nini Anggalih⁴;
Irhamna Nirbhaya Carreca⁵; Arieviana Ayu Laksmi⁶; Yunia Dwie Nurcahyanie⁷

¹⁻⁶Desain Grafis, Fakultas Vokasi, Universitas Negeri Surabaya,
Surabaya, Indonesia 60231

⁷Teknik Industri, Fakultas Teknik dan Sains, Universitas PGRI Adi Buana Surabaya
Surabaya, Indonesia 60234

¹asidigisiantipatria@unesa.ac.id; ²martadi@unesa.ac.id; ³novakristiana@unesa.ac.id; ⁴nandaanggalih@unesa.ac.id;
⁵irhamnanirbhaya@unesa.ac.id; ⁶arievianalaksmi@unesa.ac.id; ⁷yuniadwie@unipasby.ac.id

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ABSTRACT

Indonesia is rich in cultural heritage, and introducing local culture is essential for shaping a child's identity, particularly among the younger generation. However, there is a lack of engaging educational media to introduce Indonesian cultural heritage to young students. Existing materials often fail to support the development of cognitive and motor skills, and they frequently do not utilize safe and sustainable materials. Therefore, innovation is needed to instill traditional values in future generations. The research aims to design a wooden puzzle that allows children to learn through play while gaining a deeper understanding of Indonesia's cultural heritage. The research employs research and development methods, including literature reviews and in-depth interviews. Experts validated the puzzle through interviews and questionnaires with teachers to ensure it was suitable for children. The puzzles were designed in a cheerful and simple cartoon style, focusing on traditional clothing and houses. Teachers rated the puzzle's validity at 99.28%, indicating that it meets educational standards and helps students understand cultural diversity. Students gave a validation score of 97.75% based on the questionnaire criteria. The research emphasizes the effectiveness of wooden cube puzzles as an interactive learning tool that offers advantages over other similar products for introducing Nusantara's traditional clothing and houses to elementary students. The findings suggest that this puzzle can enhance student engagement and cultural awareness. Its effectiveness can be further improved through digital integration for a greater educational impact. Overall, the research concludes that using wooden cultural puzzles can effectively enhance children's cognitive skills while fostering cultural awareness and national identity.

Keywords: wooden cube puzzle, traditional clothing, traditional houses, Nusantara

INTRODUCTION

Indonesia is a country known for its rich cultural diversity, which encompasses various tribes, languages, customs, and unique traditions. However, in today's increasingly connected world of globalization, this diversity is often at risk due to the dominance of foreign cultures that permeate through mass media, technology, and the entertainment industry

(Mohamoud, 2021). To ensure that the next generation has a strong understanding of their Indonesian cultural heritage, children need to learn about it. This knowledge will help strengthen their national identity and preserve the country's cultural diversity.

The introduction of local culture is becoming increasingly important in shaping a child's identity. Recognizing that children are future agents of social change, it is crucial to introduce and appreciate

Indonesian culture from an early age. However, a significant challenge in the era of globalization is the dominance of foreign culture, which often distracts children from the richness of their local heritage. In light of these dynamic changes, creative and innovative approaches are essential for introducing the archipelago's cultural heritage to children.

The Nusantara culture is characterized by a rich diversity of customs that are deeply rooted in each region and tribe in Indonesia. These customs embody invaluable aspects of Indonesian cultural heritage. Koentjaraningrat (1985) categorizes culture into seven elements: living equipment systems, livelihood, social systems, language, arts, knowledge systems, and religion. In designing this puzzle, the focus is on the arts, particularly traditional clothing and houses. In various areas, people wear traditional clothing that features unique characteristics specific to each region. This traditional attire serves as a symbol of the region's culture (Magh'firoh & Victor, 2023). Similarly, traditional houses are distinct structures with unique construction methods, forms, functions, and decorations, passed down through generations. These houses reflect the cultural identity of the community and are used for daily life activities (Said, 2004).

With the changes of the modern era, the younger generation is increasingly drawn to emerging trends. As a result, there is a growing perception that traditional clothing is old-fashioned and boring. This situation highlights the need for innovative ways to introduce and engage the younger generation with their cultural heritage, ensuring they do not forget the valuable diversity of traditional clothing passed down by our ancestors. This rich cultural identity is a key part of the Indonesian nation's identity (Fathoni et al., 2015). Currently, traditional clothing is often only showcased during carnivals or official state events, making it feel even more distant to the younger generation, who are still in their formative years. Therefore, the media need to play a role in introducing Indonesian culture, including traditional clothing and architecture, to children as the future of the nation.

Learning about Indonesian culture from an early age offers numerous benefits for children, one of which is the development of a strong national identity. By familiarizing themselves with Indonesian culture, children gain a deeper appreciation for their country's heritage and values. This understanding fosters a sense of love for their homeland and pride in their national culture (Fatmawati, 2021).

Researchers and various stakeholders have taken steps to promote traditional clothing and houses. Their efforts include creating illustrated books, designing informational boards, and utilizing digital media such as virtual reality (Trimawarni et al., 2020; Magh'firoh & Victor, 2023; Fathoni et al., 2015). The introduction of traditional houses has primarily focused on the use of augmented reality (Abdulghani & Sati, 2019).

Educational toys have significant potential as tools to introduce local culture to children engagingly and interactively (Asmawati, 2023). One type of toy

that stands out is the wooden puzzle. These puzzles not only provide entertainment for children but also aid in the development of various cognitive, motor, and social skills. By using wooden puzzles as a medium, we can effectively introduce children to the rich diversity of Indonesian culture.

It is essential to acknowledge that there is a scarcity of educational toys that accurately reflect the richness of Indonesian culture. To address this gap, educational wooden toys that introduce Indonesian culture can take various forms, such as board games, puzzles, wooden dolls, and disassemblable toys (Ramlan & Bahalwan, 2021; Sa'idah et al., 2020; Adenin et al., 2021; Amalina & Primaditya, 2013; Ebit et al., 2018).

The research aims to address a gap by designing a wooden puzzle that reflects Indonesian culture and heritage. The objective is to help children learn through play and gain a deeper understanding of Indonesia's cultural heritage. Based on the identified problems and the proposed solutions, this applied research has two main objectives. First, to create a wooden puzzle that introduces Indonesian culture to elementary school children. Second, to test the wooden puzzles with these children.

METHODS

The research falls under the category of research and development (R&D) as it focuses on designing, developing, and testing educational media (Gustiani, 2019). The process involves creating content, validating it with experts, and conducting limited trials with elementary school students. The objective is to produce culturally relevant learning materials that are effective and applicable in real educational settings.

The research begins with a study of the literature on Indonesian culture, with a particular focus on traditional clothing, traditional houses, and children. In depth interviews and observation are conducted at various schools in the area, to gain insights into the behavior and daily lives of children in Surabaya. Additionally, interviews are conducted with elementary school teachers to explore appropriate lesson materials related to traditional clothing and houses in the Nusantara.

Visual documentation through photographs can enhance the analysis of the appropriateness of puzzle illustration subjects within Indonesian culture, such as traditional clothing and houses. Literature analysis serves as the foundation for compiling findings from other data collection methods. The analysis process will start by reducing or condensing the data, followed by presenting it narratively, verifying the information, and simultaneously interpreting the results. The steps for conducting developmental research are outlined in the diagram in Figure 1.

The expert validation involved conducting interviews using a questionnaire. The validators for the research were five teachers who teach fourth and

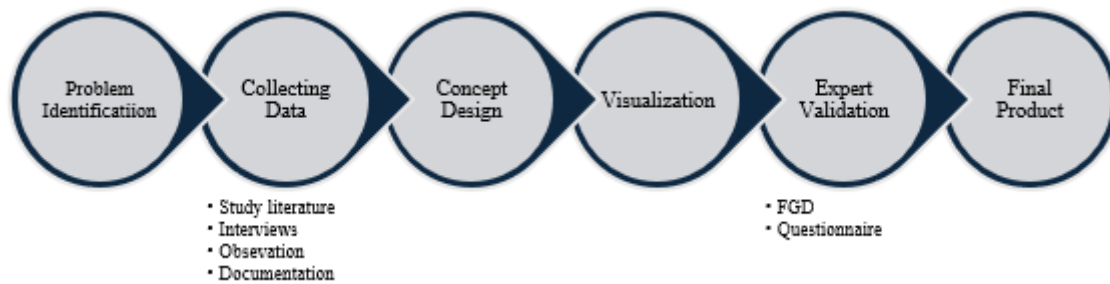


Figure 1 Methods flowchart

fifth grades. A closed-ended questionnaire is utilized, where the validators assess the toys using a Likert scale to determine their suitability for elementary school students. At the end of the questionnaire, the validators are invited to provide feedback.

Validation confirms that the puzzle is appropriate for limited testing with children. Data analysis is carried out to interpret the validation results. Feedback and suggestions for improvement from the validation instrument questionnaire, along with qualitative descriptive statistical analysis, were used to analyze the data, which was presented as a percentage analysis.

The validated puzzle is tested on elementary school children in Surabaya to assess its effectiveness. Limited trials involve observation techniques, focusing on how children engage with the puzzles during play. The results of these initial trials are analyzed to evaluate effectiveness. If any issues arise, the puzzle will be revised based on feedback from the children. Following this, the final version of the puzzle, incorporating input from the trials, will undergo broader testing across multiple elementary schools in Surabaya.

Validation is necessary to assess the practicality of cube puzzles. Five experts conducted the validation process. The validators, who are teachers from fourth and fifth grades, evaluate the wooden cube puzzles. The criteria for interpreting the categories based on the percentage analysis of the validators' assessments are presented in Table 1.

Table 1 Criteria for Interpretation Categories

Value (%)	Validation level
85.01 – 100.00	Very Suitable (usable but needs minor revision)
70.01 – 85.00	Suitable (usable but needs minor revision)
50.01 – 70.00	Not Suitable (usable but needs major revision)
01.00 – 50.00	Not useable

RESULTS AND DISCUSSIONS

The market analysis of the Indonesian traditional clothing and wooden house puzzle markets utilizes segmentation, targeting, and positioning analysis.

Table 2 presents an analysis of the potential market for wooden cube puzzles. Specifically, Table 2 highlights the psychographic profiles of contemporary parents from various social classes who may be interested in these products.

Table 2 Market Analysis

	Description
Segmentation	
1. Demographics	Users: fourth- and fifth grades, 10-12 years old Buyers: 25 and 40 years old Gender: Male and Female. Education: Bachelors
2. Socioeconomic	The middle class
3. Jobs	professional, self-employed, housewife, and teacher
4. Geographically	Indonesia, affordable internet access (for searching for information, shopping)
5. Psychographics	The users of puzzles are millennial parents who prioritize the importance of children's education through cognitive and affective development
Target	Parents with children aged 10-12 years who live in urban and suburban areas in Indonesia, have internet access, and are looking for quality educational puzzles that are useful for developing children's cognitive, motor, and affective skills
Position	Premium educational puzzle made from wood that is fun, safe, and effective

The target demographic for these children's puzzles consists of elementary school children in fourth and fifth grades, aged 10 to 12 years. This group also includes their parents and elementary school teachers, typically aged between 25 and 40 years, regardless of gender. Most of these individuals come from a middle-class socioeconomic background and have attained at least a bachelor's degree. Typical job roles among this demographic include professionals, self-employed individuals, homemakers, and teachers.

Geographically, the users of these puzzles are spread throughout Indonesia, with a particular concentration in urban and suburban areas where affordable internet access is available for information searching and shopping. The focus is on middle-class housing in metropolitan areas that have been well-developed.

Examining the psychographic profiles, puzzle users are predominantly millennial parents who prioritize the significance of children's education, encompassing both cognitive and emotional development. This demographic often seeks alternatives to digital devices, opting for puzzles that not only engage their children in play but also contribute meaningfully to their learning experiences. These parents are dedicated to providing their children with enriching activities that promote knowledge acquisition alongside entertainment.

The lifestyle characteristics of users can be defined by their proficiency in technology, active engagement on social media platforms, modernity, and openness to new experiences. Openness denotes a willingness to accept information and influences from external sources while simultaneously honoring traditional and cultural values. Throughout, they have consistently demonstrated concern for health and environmental issues.

Upon examining the behaviors of millennial parents, several key traits become apparent. These contemporary families, often referred to as young families, actively follow parenting trends, prioritize quality time spent with their children to enhance familial bonds, and frequently seek information online. They show a preference for locally sourced products and select safe alternatives composed of natural ingredients. Furthermore, they are committed to environmentally sustainable practices and strive to minimize gadget usage among their children from an early age.

The primary target audience for these puzzles comprises parents of children aged 10 to 12 years residing in urban and suburban areas of Indonesia. This demographic possesses internet access and is actively seeking high-quality educational puzzles that contribute to the development of their children's cognitive, motor, and emotional skills. The secondary target audience comprises educational institutions that cater to school-aged children and are seeking interactive and engaging learning media to introduce Indonesian culture to their students effectively.

The Nusantara Wooden Cube Puzzle is a premium educational toy crafted from wood. It is designed to be both enjoyable and effective in introducing children to the rich diversity of traditional Indonesian clothing and houses. Additionally, it aims to foster a love for Indonesian culture among young learners.

These wooden puzzles are designed to introduce children to Indonesian culture, with a specific focus on traditional clothing and houses. The puzzles present these themes in an attractive and age-appropriate manner, using bright colors and child-friendly designs.

During the design process, we carefully adjust the size and shape of the puzzle pieces to match children's motor skills. Additionally, using safe and non-toxic paint ensures their safety during play. These puzzles offer a fun and educational experience, helping children learn about the richness of Indonesian culture from a young age.

The illustrations used in this wooden puzzle feature cheerful and straightforward cartoon designs with bold lines and simple shapes. These cute and recognizable cartoon characters appeal to children, showcasing slightly exaggerated body proportions, such as heads that are larger than their bodies. The artwork employs a bright and striking color palette, including red, green, blue, and yellow, which effectively captures attention and brings each character to life. Although the cartoon style is simple, it still incorporates details of traditional clothing from various regions in Indonesia. These details include typical ornaments such as songket cloth, batik, and traditional headdresses, offering a visual education on the cultural diversity of the archipelago. The characters' facial expressions are friendly and happy, creating a cheerful and adorable impression with their smiles and large eyes. Each character is set against a contrasting color background, helping them to stand out individually and making it easier for children to focus on the details of the traditional clothing.

Illustrations of traditional houses are presented with distinctive details that make them easily recognizable, characterized by firm lines and simple shapes. Bright color palettes, featuring contrasting backgrounds such as orange, blue, and green, enhance the visual appeal of each custom home. Although the illustrations adopt a cartoon style, they still effectively showcase the typical architectural elements of each traditional house, including the roof shape, building structure, and traditional ornaments. This approach provides a visual education about the unique architecture found across various regions of Indonesia. The straightforward design allows children to easily identify and remember the distinctive features of each traditional house, conveying information clearly and directly. The list of traditional clothing and houses used in wooden puzzles is presented in Table 3.

The following illustration, shown in Figure 2 below, demonstrates wooden puzzles applied to wooden cubes. The illustration measures 8 cm x 12 cm and 12 cm x 12 cm. To facilitate the division of the image into blocks, guidelines have been added to outline the arrangement of the blocks. This helps designers understand which parts are created by the cube blocks.

The toy puzzle must be designed with a primary emphasis on child safety to minimize the risk of injury. Consequently, the materials used must adhere to established safety standards and be free from hazardous chemicals. Furthermore, the sources of these materials should be readily accessible, employing naturally occurring environmental resources or other sustainable options such as wood, leaves, and bamboo. These

natural materials can serve as practical foundational elements in the development of educational resources (Qadafi, 2021).

Table 3 List of Traditional Clothing and Houses

No	Island	Clothing	House
1.	Sumatra	Batak Toba Ulos	Bolon
2.	Sumatra	Minangkabau Bundo Kanduang	Gadang
3.	Java	Kebaya	Joglo
4.	Java	Pesa'an (Madura)	Taneyan Lanjhang
5.	Kalimantan	Dayak Ta'a and Sapei Sapaq	Batang
6.	Kalimantan	Buang Kuureng	Batang
7.	Sulawesi	Bodo	Walewangko
8.	Sulawesi	Toraja Pokko	Tongkonan
9.	Maluku	Materen Lamo	Baileo
10.	Bali	Payas Agung	Bali House
11.	Nusa Tenggara	Lambung	Bale
12.	Papua	Sail Cloth and rumbai skirts	Honai



Figure 2 Wooden Cube Puzzles Design

The development process in children encompasses the growth of motor skills, language, and social behaviors (Ráczová et al., 2024). To enhance children's fine motor skills, toys such as blocks, balls, and pencils can be utilized (Fauziah & Puspitasari, 2024). These toys are made from a variety of materials, including wood. Wooden toys are particularly appealing to children due to their unique natural qualities and eco-friendly characteristics. The warm texture of wood provides a pleasant tactile experience, enriching children's playtime (Agustrian & Setiawan, 2020). Pine wood is recommended as

a suitable material (Pahlevy & Mardiana, 2021). It features a slightly smooth texture, a shiny surface, wavy grains, and low oil content. Furthermore, pine wood is relatively affordable, readily available, and can be easily worked with using a variety of techniques (Agustrian & Setiawan, 2020). The final product is illustrated in Figure 3.



Figure 3 Picture Prototype Wooden Cube

As a continuation of the design process for these puzzles, a validation process was conducted in an elementary school. Before validating the puzzle with the teachers, the research team conducted a Focus Group Discussion (FGD) that included homeroom teachers of first- and second-grade students. This discussion aimed to ensure that the validated puzzle prototype would be suitable for elementary school students.

Initially, the researchers intended to target students in grades 1 and 2 as potential respondents. However, the teachers pointed out that lessons related to traditional clothing and traditional houses were part of the curriculum for fourth- and fifth-grade students. Additionally, they noted that the complexity of the drawings would be too challenging for students in the lower grades. As a result, the researchers decided to test the puzzles with students in fourth and fifth grades during the next meeting.

The validators for these wooden cube puzzles are five teachers who teach grades IV and V. According to the validity level table, the score obtained for validating these puzzles is 99.28%. This indicates that the puzzles are valid and suitable for use with elementary school children in fourth and fifth grades, as shown in Table 4.

According to the data criteria table, two out of five validators did not award a perfect score for the media's effectiveness. However, the average score remains high. The validators noted that this puzzle effectively increases students' interest in learning about Indonesian culture and helps them visually understand cultural differences, fostering an appreciation for cultural diversity in Indonesia. Additionally, it promotes the development of fine motor skills and logical thinking. The puzzle can be played in a group setting with minimal guidance from the teacher.

Table 4 Validation Results

Criteria	Validator (%)					Mean (%)
	1	2	3	4	5	
Media effectiveness	91	91	100	100	100	96.4
Attractiveness	100	100	100	100	100	100
Suitability for students	100	100	100	100	100	100
Material	100	100	100	100	100	100
Sustainability	100	100	100	100	100	100
Average						99.28
Design Quality Criteria					Very Suitable	

In terms of attractiveness, suitability for students, material quality, and product sustainability, all validators unanimously agreed that the wooden cube puzzle is "Very Suitable." The puzzle's appeal is enhanced by its illustrations, which are enjoyable and easy for students to understand, showcasing the diversity of Indonesian culture in a fun and engaging manner. The validators believe that this puzzle is appropriate for the understanding level of grade 4 and 5 elementary school students. They expressed confidence that students would be enthusiastic about using this puzzle because they would feel capable of completing it.

Overall, this puzzle serves as an effective learning medium to facilitate discussions about cultural diversity in the classroom. Its high-quality materials and design make it suitable for elementary students, as it is strong, durable, and easy to store, occupying minimal space.

After the validator approved the wooden cube puzzles, they were tested on 10 fourth-grade students and 10 fifth-grade students. Each student had the opportunity to try two types of wooden cube puzzles: traditional clothing and traditional houses. Students were allowed to attempt each puzzle once.

Observations showed that each student completed the traditional clothing puzzle in 2 minutes and the traditional houses puzzle in 5 minutes, reflecting the differences in the number of pieces and the complexity of the images. All students worked on the puzzles under the supervision and guidance of their teacher. Once a student finished assembling a puzzle, they presented it to the teacher.

Providing elementary students with the opportunity to learn about Nusantara's traditional dress and houses through puzzles aligns with the benefits of puzzles as an educational tool. Research indicates that puzzles can enhance cognitive abilities, particularly in the context of traditional attire and architecture (Pratiwi et al., 2020; Anggoro & Netra, 2022). By assembling puzzle pieces, students also develop their fine motor skills (Harmila et al., 2023; Mulyana & Nurcahyani, 2022). Furthermore, this activity can stimulate their problem-solving abilities (Utami et al., 2024).

As students work on the puzzle, they engage in systematic thinking, following instructions to construct the puzzle correctly. This process enables both brain function and fine motor skills to work together effectively. Observations during the puzzle assembly indicated that students were active and enthusiastic about learning about Nusantara's traditional dress and houses. To further evaluate their engagement, we provided a questionnaire to assess their responses to the wooden cube puzzle as a learning medium. Table 5 presents the results of the student response data regarding the wooden cube puzzle as an educational tool.

Table 5 Results of Student Response Validation

No	Criteria	Score (%)	Average
1.	Attractiveness	98	97.75%
2.	Convenience	98	
3.	Increase knowledge	99	
4.	Dependencies	96	
Student Response Quality Category			Very Good

Based on the responses of 18 out of 20 students who completed the questionnaires, it was found that the aspects of attractiveness and convenience both received the same rating of 98%. The students enjoyed playing the puzzle because they saw the illustrations and shapes as appealing, particularly the vibrant colors. They also reported that assembling the puzzles was easy. Additionally, the aspect of increased knowledge received the highest rating at 99%. This indicates that most students gained a deeper understanding of traditional clothing and houses after playing with the puzzle.

The aspect of dependencies received the lowest score, which is 96%. Students expressed a desire to play with the puzzle cube again. One student mentioned, "This cube puzzle makes me more enthusiastic about learning about Indonesia." Overall, the average final score is 97.75%, indicating that the wooden cube puzzles are an excellent tool for learning about traditional Nusantara dresses and houses. During the learning process, elementary students demonstrated enthusiasm, energy, and eagerness to participate. The puzzles feature an appealing design with vivid colors and illustrations, making them attractive to students and encouraging their involvement in learning about Nusantara's traditional dresses and houses.

Educational toys are tools designed to promote the growth and development of students, aligning with standard levels of child development achievement (Nurfadilah et al., 2021). These engaging activities can serve as valuable educational tools or aids. Educational toys help enhance language skills, cognitive development, and interaction with the environment (Hijriati, 2017). One indicator of a toy's

educational value is its ability to foster specific skills in children, including cognitive, social, and emotional development. Educational toys can incorporate features like disassembling, combining, matching, grouping, assembling, forming, and arranging (Saikia et al., 2023). Blocks, for example, are exploratory play materials that help children discover new experiences and concepts (Nurfadilah et al., 2021).

CONCLUSIONS

The design and development of wooden puzzles represent a meaningful effort to introduce Indonesian culture to children from an early age. The puzzles feature 12 illustrations of traditional clothing and 12 illustrations of traditional houses, each carefully applied to wooden cubes measuring 4×4 cm. Validation results confirmed that these puzzles meet the necessary criteria for content validity and media feasibility, allowing them to be further tested and implemented in elementary schools.

Testing with elementary school students indicated that the puzzles were not only valid but also effectively engaged the students. They were deemed safe and appropriate for their developmental stage. The puzzles offer several significant advantages. First, they provide a fun and interactive medium that actively stimulates children's cognitive abilities, particularly problem-solving, visual-spatial skills, and fine motor skills. Second, by incorporating images of traditional clothing and houses, the puzzles serve as an effective tool for enhancing cultural literacy and fostering a sense of national identity among children. Third, the use of natural wood materials ensures durability and sustainability while also strengthening the tactile learning experience. Furthermore, compared to conventional learning media, these puzzles encourage collaborative learning and increase motivation and curiosity in exploring cultural diversity.

The research has significant implications for education and cultural conservation. The wooden cube puzzle serves as an effective alternative learning tool for introducing elementary school students to the traditional clothing and houses of the Indonesian archipelago. By utilizing a play-based learning approach, this educational resource enhances thematic learning in Social Studies and Arts, making cultural knowledge more engaging and memorable for young learners. Teachers can use this puzzle as an advanced teaching tool to boost student engagement and promote experiential learning methods. Schools may also incorporate similar educational media to support interactive cultural education. Additionally, this puzzle encourages early cultural awareness, helping students appreciate and preserve Indonesia's rich cultural heritage.

The research was limited to a small sample of just one elementary school in Surabaya, which may affect the generalizability of the results. Additionally, the research focused solely on short-term engagement,

without assessing long-term learning or cultural retention. Future research could be enhanced by incorporating supplementary content or integrating digital technology, such as augmented reality (AR), to improve educational effectiveness.

Previous studies have developed cultural puzzles to support children's learning and cultural recognition in specific regions of Indonesia. The research aims to offer a broader cultural perspective by combining traditional clothing and houses while emphasizing tactile and sustainable learning through the use of wooden materials. Therefore, the research contributes to the development of creative and culturally relevant learning media that support visual literacy and foster a deeper understanding of cultural diversity among elementary school students.

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Data Availability Statement: Data available within the article or its supplementary materials. The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

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