Innovation in Numeracy Learning through the Make a Match Method Based on Local Wisdom of Malang for Children Aged 4-5 Years

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	Abstract
Keywords: Local Wisdom; Make a Match Method; Numeracy; Early Childhood Education	Numeracy learning from an early age is the foundation for students' academic success at the next level of education. However, current numeracy learning is still one-way, focused on memorizing numbers, so it does not provide meaningful experiences for students. This study aims to analyze the application of the Make a Match method based on Malangan local wisdom in numeracy learning for students aged 4-5 years. The research method uses a descriptive qualitative approach through participatory observation techniques, in-depth interviews, and documentation at Dharma Wanita Kindergarten, Malang Regency. The results of the study revealed that the application of the Make a Match method based on Malangan local wisdom succeeded in transforming numeracy learning. Success is reflected in the enthusiasm of students in participating in learning that integrates Malangan Masks and batik motifs into numeracy materials. Supporting factors include the creativity of educators in developing learning media and collaboration with local artists. Inhibiting factors include limited preparation time and the lack of cultural references that suit the characteristics of early childhood students. Recommendations for program development include ongoing training for educators related to cultural integration into learning and the preparation of a local cultural database that has been adapted for early childhood learning.

	Abstrak
Kata Kunci: Kearifan Lokal;	*Pembelajaran numerasi sejak usia dini merupakan landasan keberhasilan akademik peserta didik pada jenjang pendidikan selanjutnya. Namun, pembelajaran numerasi saat ini masih bersifat satu arah yang terfokus pada*

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Metode Make a Match; Numerasi; Pendidikan Anak Usia Dini	*kegiatan menghafal angka sehingga kurang memberikan pengalaman bermakna bagi peserta didik. Penelitian ini bertujuan menganalisis penerapan metode Make a Match berbasis kearifan lokal Malangan pada pembelajaran numerasi peserta didik usia 4-5 tahun. Metode penelitian menggunakan pendekatan kualitatif deskriptif melalui teknik observasi partisipatif, wawancara mendalam, dan dokumentasi di TK Dharma Wanita Kabupaten Malang. Hasil penelitian mengungkap bahwa penerapan metode Make a Match berbasis kearifan lokal Malangan berhasil mentransformasi pembelajaran numerasi. Keberhasilan tercermin dari antusiasme peserta didik mengikuti pembelajaran yang mengintegrasikan Topeng Malangan dan motif batik ke materi numerasi. Faktor pendukung meliputi kreativitas para pendidik mengembangkan media pembelajaran serta kolaborasi dengan seniman lokal. Adapun faktor penghambat mencakup keterbatasan waktu persiapan dan minimnya referensi budaya yang sesuai karakteristik peserta didik usia dini. Rekomendasi pengembangan program yaitu pelatihan berkelanjutan bagi para pendidik terkait integrasi budaya ke pembelajaran serta penyusunan database budaya lokal yang telah disesuaikan untuk pembelajaran usia dini.*

1. Introduction

Numeracy education is an important aspect of learning that needs to be instilled from an early age, especially in the 4-5 year range as a critical period for students' cognitive development (Dewi, 2024). In this phase, students begin to develop an understanding of the concepts of numbers, patterns and simple mathematical relationships which become the basis for mathematical abilities at the next level of education (Bernabini et al., 2020). Standards for achieving numeracy development for students aged 4-5 years include the ability to number 1-10, recognize the concept of many-little, sort objects based on size, and group objects based on color, shape and size. Good numeracy skills not only support academic achievement, but also equip students with problem-solving skills in everyday life (Azahra et al., 2024).

Based on the results of initial observations at the Dharma Wanita Kindergarten, Malang Regency, numeracy learning is still one-way and does not involve the active participation of students. Educators tend to use conventional methods such as memorizing numbers and repetitive exercises without meaningful context. Vasoya & Vansdadiya (2023) revealed that this learning approach causes 65% of students to have difficulty connecting mathematical concepts with real experiences. This is in line with the findings of Charitaki et al., (2021) which show that conventional numeracy learning has an impact on low student interest in learning.

Make a Match as an active learning method has been proven to increase student participation and understanding through matching card pair activities (Nufitasari et al., 2024). This method encourages students to actively search for card pairs while learning certain concepts in a fun playful atmosphere (Amiruddin et al., 2022). The results of a preliminary study in five kindergartens in Malang City revealed that the implementation of Make a Match has not integrated contextual elements that are close to the lives of students, especially local wisdom (Kusumaningtyas & Mirtasari, 2024).

Malang City has a wealth of culture that can be used as a meaningful learning resource for students. Malangan Mask presents various characters that can be used to introduce the concept of numbers, such as counting the number of ornaments on the mask or grouping masks based on color and shape. Malangan batik motifs are also rich in geometric elements that support learning patterns and shapes. The integration of local cultural elements creates a learning experience meaningful because it is directly related to the socio-cultural environment of students (Sulistyani & Deviana, 2021).

Several previous studies have examined the application of the Make a Match method at the PAUD level. A study by Veryawan et al., (2022) showed an increase in the cognitive abilities of students aged 5-6 years through the application of Make a Match in the introduction of simple mathematical concepts. Meanwhile, research by Mayasari et al., (2020) found that the use of local wisdom-based learning media succeeded in increasing the learning interest of students aged 4-5 years. However, research that specifically studying the application of Make a Match based on local wisdom of Malangan in numeracy learning for children aged 4-5 years is still limited.

The uniqueness of this study lies in the integration of local wisdom of Malangan into the Make a Match method. The selection of the Malangan Mask as a learning base is based on the uniqueness of its character that represents local cultural values and its suitability for numeracy learning for children aged 4-5 years. Each mask character has unique characteristics that can be utilized to develop concepts of numbers, patterns, and classification. Learning media designed using Malangan Mask illustrations and batik motifs that are familiar to students.

Based on this explanation, this study examines the application of the Make a Match method based on local Malangan wisdom in numeracy learning for children aged 4-5 years. The focus of the study includes the process of implementing the method, supporting factors and inhibitors, and students' responses to learning. The results of this study are expected to provide practical benefits for the development of early childhood numeracy learning that integrates local cultural values.

2. Methode

This study uses a qualitative approach with a case study design to examine the implementation of the Make a Match method based on local wisdom of Malangan in numeracy learning for children aged 4-5 years. The selection of the case study design is in accordance with the

research objectives which seek to deeply reveal the process of implementing learning innovations at Dharma Wanita Kindergarten, Malang Regency as a unique single case (W. Creswell, 2014). Through this approach, researchers directly observe the learning process and interactions that integrate local cultural elements.

The location of the study was at Dharma Wanita Persatuan Kindergarten, Malang Regency, located on Jalan Surabaya, Malang City, East Java. The selection of the location was based on the characteristics of schools that actively implement innovative learning and are in an environment rich in Malangan culture. The study was conducted for one semester of learning, starting from July to December 2024 to obtain comprehensive data.

The sources of research data include class teachers of group A (ages 4-5 years) as learning implementers and students as learning subjects. Data collection was carried out through participatory observation techniques, in-depth interviews, and documentation. Observations focused on the learning process using the Make a Match method based on local wisdom of Malangan, including preparation, implementation, and evaluation of learning.

In-depth interviews were conducted with class teachers to gather information about the experience of implementing learning methods, challenges faced, and strategies for overcoming obstacles. Documentation includes collecting lesson plans, local wisdom-based learning media, students' work, and photos and videos of learning activities. Triangulation of sources and techniques was applied to ensure the validity of the research data (Zainuddin & Hardiansyah, 2023).

Data analysis used an interactive model that included the stages of data reduction, data presentation, and drawing conclusions. At the reduction stage, data from observations, interviews, and documentation were sorted according to the focus of the research. The data was then presented in the form of a descriptive narrative that systematically describes the learning process. Conclusions were drawn by interpreting research findings based on relevant theories and previous research.

Researchers applied the principles of research ethics through written approval from the school and parents of students. The identities of participants were kept confidential by using pseudonyms in reporting the research results. The entire process of data collection and analysis was carried out transparently and could be scientifically accounted for.

3. Result and Discussion
Concept of the Make a Match Method Based on Malangan Local Wisdom

The Make a Match method based on Malangan local wisdom is a development of a cooperative learning method that integrates local cultural elements into the activity of matching paired cards. The learning concept is designed to achieve the goals of mastering numeracy concepts and introducing local cultural values. The integration of these two aspects creates a meaningful learning

experience that is appropriate to the developmental stage of children aged 4-5 years (Veryawan et al., 2022; Nikmah, 2022).

This method is different from conventional learning methods. The fundamental difference between the Make a Match method based on Malangan local wisdom and the conventional method lies in the aspects of implementation and learning outcomes (Sartika et al., 2024; Astuti et al., 2024). This can be seen in table 1 below:

Table 1.
Differences in the Make a Match Method Based on Local Wisdom and Conventional Methods

Aspects	Make a Match Method Based on Local Wisdom	Conventional Method
Learning Approach	1. Active-cooperative learning based on local culture 2. Integration of local wisdom values of Malangan 3. Student-centered	1. One-way learning 2. Focus on numeracy material only 3. Teacher-centered
Learning Media	1. Paired cards with local cultural illustrations 2. Malangan masks as teaching aids 3. Batik motifs as learning contexts	1. Simple number cards 2. Number posters 3. Conventional LKS
Learning Activities	1. Finding pairs of cards while actively moving 2. Exploring local cultural elements 3. Social interaction through games	1. Memorizing numbers 2. Doing written exercises 3. Individual activities
Teacher Role	1. Learning facilitator 2. Cultural mediator 3. Creative media developer	1. Material deliverer 2. Instruction giver 3. Results assessor
Community Engagement	1. Collaboration with local artists 2. Participation of cultural studios 3. Community support	1. Limited to school scope 2. Minimal external involvement 3. Internal focus
Learning Evaluation	1. Process and outcome assessment 2. Observation of overall development 3. Documentation of activities	1. Outcome assessment 2. Written test 3. Focus on cognitive
Learning Outcomes	1. Numeracy and cultural literacy 2. Social skills 3. Strengthening cultural identity	1. Numeracy 2. Number recognition 3. Memorization of concepts

Based on the comparison table, the Make a Match method based on local wisdom of Malangan provides a more comprehensive learning experience than conventional methods. The active-cooperative learning approach that integrates local cultural elements encourages

optimal participation of students while introducing local wisdom values. The use of contextual learning media such as Topeng Malangan and batik motifs creates meaningful numeracy learning. Community involvement through collaboration with artists and cultural studios enriches learning resources while supporting the preservation of local culture.

The evaluation aspect of learning in the Make a Match method based on local wisdom does not only focus on results, but also pays attention to the overall development process of students. Learning outcomes include mastery of numeracy concepts, development of social skills, and strengthening cultural identity. This learning model provides an alternative solution for the development of numeracy learning methods that integrate local cultural values in children aged 4-5 years (McKevett et al., 2024; Adedigba, 2023).

Implementation of the Make a Match Method Based on Local Wisdom of Malangan

The Make a Match method based on local wisdom of Malangan has presented a transformation of learning at Dharma Wanita Kindergarten, Malang Regency. Research conducted by Amalia et al., (2022) shows that numeracy learning based on local culture can create meaningful learning experiences for early childhood learners. This learning methodology applies systematic stages that integrate local wisdom of Malangan into numeracy learning. Numeracy learning indicators for students aged 4-5 years include: (1) recognizing numbers 1-10, (2) counting objects in sequence, (3) connecting the number of objects with number symbols, (4) grouping objects based on number, and (5) understanding the concept of many-few.

First, Learning preparation. The learning preparation stage is carried out through three main activities, namely: (1) preparing a learning plan; (2) making paired card media; and (3) designing learning scenarios. The weekly and daily learning plan preparation activities include objectives, materials, media, and learning steps. The creation of paired card media consists of number cards 1-10 and Malangan Mask picture cards and batik motifs with the appropriate number. Finally, designing a learning scenario that combines traditional games and local cultural elements.

Kristiana & Yuliana (2022) emphasized that local wisdom-based learning media has been proven to increase students' understanding of learning materials while fostering cultural appreciation. The development of this learning media integrates Malangan Mask, a typical regional batik motif, and traditional games as a means of introducing the concept of numeracy.

Second, Implementation of learning. The implementation stage of learning is divided into opening, core, and closing activities. The opening activity begins with an introduction to Malang folklore using Malangan Mask as a storytelling medium. Kisno et al., (2022) showed the effectiveness of local culture-based storytelling media in arousing students' interest in learning. The core activity implements the Make a Match game with the following steps: (1) random card distribution, (2) students look for pairs of number cards with picture

cards that match the number, (3) students mention numbers and count the number of pictures on the cards found. The closing activity is in the form of learning reflection through questions and answers about the activities that have been carried out.

The success of the initial learning stage continued in the core activity that implemented the Make a Match game using matching cards with local cultural nuances. Students showed activeness in looking for card pairs while getting to know elements of Malangan culture. Based on the results of field observations, it revealed the high enthusiasm of students when looking for card pairs containing images of traditional arts and typical Malang batik motifs. Learning activities are designed in an integrated manner to develop numeracy skills while strengthening understanding of local wisdom values.

Third, learning evaluation. The learning evaluation stage is carried out through direct observation and documentation using instruments developed based on the theory of early childhood learning evaluation dini (Et al (Ionescu), 2021). The cognitive aspect measures the achievement of numeracy indicators including the ability to recognize numbers, count, and relate quantities to number symbols. The affective aspect assesses enthusiasm, activeness, and appreciation of local culture. The psychomotor aspect observes motor coordination when looking for card pairs.

The results of learning documentation show an increase in students' ability to match cards and understand the concept of numbers. This development is recorded through observation sheets and learning portfolios compiled by educators. Anecdotal notes show an increase in student activeness during the learning process. Photo and video documentation further strengthens the evidence of students' enthusiasm when involved in local wisdom-based learning activities.

The learning reflections carried out revealed the success of integrating local culture into the Make a Match method to create meaningful learning experiences. Educators said that local wisdom-based learning media facilitated the delivery of numeracy materials to students. Field observations proved that students found it easier to understand numeracy concepts when delivered through media that were close to everyday life. Through the integration of local culture into learning, students grew a sense of pride in the local wisdom of the region.

A comprehensive evaluation of the implementation of learning identified several important notes as development materials. Educators need to pay attention to the suitability of learning media with the characteristics of student development. The selection of cultural elements integrated into learning must consider the level of understanding of early childhood learners. The development of learning media based on local wisdom requires creativity and a deep understanding of local culture.

Based on the results of the research conducted, it can be seen that overall the implementation of the Make a Match method based on local wisdom of Malangan has had a positive impact on numeracy learning at Dharma Wanita Kindergarten, Malang Regency. This

learning method creates a fun and meaningful learning atmosphere for early childhood learners. The integration of local culture into numeracy learning has succeeded in fostering students' appreciation of local wisdom. The successful implementation of this method provides inspiration for the development of local culture-based learning in other early childhood education institutions.

Figure 1.
Implementation of the Make a Match Method Based on Local Wisdom of Malangan

Figure 1 shows numeracy learning activities using the Make a Match method that combines elements of Malangan culture. Educators use local wisdom-based learning media to introduce the concept of numeracy to students. Learning activities are designed so that students actively move to find card pairs while learning about local cultural values.

Supporting and Inhibiting Factors for the Implementation of Make a Match Based on Local Wisdom in Malangan

The implementation of the Make a Match method based on local wisdom in Malangan presents various factors that mutually influence the success of learning. The results of the study at Dharma Wanita Kindergarten, Malang Regency showed a relationship between supporting and inhibiting factors that influence the effectiveness of the learning method.

The creativity of educators in developing learning media is the main factor in the success of this method. Dharma Wanita Kindergarten educators explore Malangan cultural information in depth to create interesting learning media. Fairus et al., (2024) revealed that the success of local wisdom-based learning depends on the ability of educators to adapt cultural elements to learning activities. Learning innovations carried out by educators include the development of matching cards that combine the concept of numeracy with elements of Malangan culture.

In line with the creativity of educators, the involvement of the community around the school enriches culture-based learning resources. Dharma Wanita Kindergarten collaborates with the Topeng Malangan art studio and local batik craftsmen. Graham (2023) explained that collaboration between educational institutions and local artists creates meaningful learning experiences. The presence of traditional artists in schools provides students with direct experience in learning about Malangan art.

As the learning program progresses, several obstacles were identified through field data analysis. Educators face limited time to prepare for learning due to the in-depth research needed to develop culture-based media. Riatin & Darmiaty (2020) emphasized that limited preparation time is a common challenge for local culture-based learning in PAUD institutions. This problem has an impact on the quality of the learning media produced.

The limited cultural references that suit the characteristics of early childhood learners also hamper the learning preparation process (Soenaryo et al., 2024). Field observations at Dharma Wanita Kindergarten revealed the difficulty of finding reference sources that can be adapted for early childhood learning. Educators need more time to simplify cultural concepts so that they are easy for students to understand. Afriliani et al., (2023) suggest compiling a local culture database that has been adapted for early childhood learning.

The support of the principal is key to overcoming various learning obstacles. The leadership of the Dharma Wanita Kindergarten principal encourages innovation among educators in developing culture-based learning media. Hidayati et al., (2020) found that support from educational institution leaders plays a role in increasing educators' motivation to develop local wisdom-based learning. The principal facilitates media development training and collaboration with the surrounding community. Evaluation of the implementation of the Make a Match method based on local wisdom in Malangan resulted in recommendations for program development. Educators need to receive ongoing training related to cultural integration into learning. Sumarwiyah et al., (2021) suggest mentoring cultural experts to help educators develop appropriate learning media. This recommendation is valuable input for the development of local wisdom-based learning programs in the future.

Students' Responses to Learning

The Make a Match method based on Malangan culture received a positive response from students at Dharma Wanita Kindergarten, Malang Regency. Based on field observations, students showed high enthusiasm when participating in learning that integrated local cultural elements into numeracy materials. Students' activeness was seen when participating in the activity of matching cards with typical Malangan pictures with the given number concept. Students' enthusiasm for learning was seen through dynamic interactions when completing the teacher's card matching task.

In addition, the use of learning media with a Malangan cultural nuance created a pleasant learning atmosphere. Students showed

particular interest in paired cards containing images of Malangan Masks and typical regional batik motifs. In line with these findings, Aisyah et al., (2024) noted that learning media based on local culture succeeded in arousing the learning interest of early childhood students. Observations in the classroom showed the joy of students when looking for card pairs while getting to know elements of Malangan culture.

As the learning progressed, students showed a development in their understanding of the concept of nuance. Educators recorded students' ability to recognize number symbols 1-10 through the activity of counting the number of Malangan Masks or batik motifs on picture cards. Andriani et al., (2020) emphasized that the use of concrete culture-based media makes it easier for students to understand abstract concepts such as numbers. Student development records showed an increase in counting skills along with the use of local culture-based learning media.

Social interactions between students also developed during the learning process. Students showed the ability to work together when looking for matching card pairs. Sakti et al., (2024) revealed that local culture-based learning encourages the growth of social skills in early childhood students. Activity documentation shows students helping each other find the right card pairs.

The success of learning is also reflected in the growth of students' appreciation for local culture. Students showed interest in learning more about Malangan Masks and batik motifs found in learning media. Al-Mansour (2022) explained that introducing culture from an early age helps shape students' cultural identity. Field observations revealed students' enthusiasm when interacting with Malangan Mask artists who were invited to school.

The development of the language aspects of students was also observed during the learning process. Students actively asked questions and told stories about the cultural elements contained in the learning media. Nurjanah et al., (2023) explained that local culture-based learning supports the development of communication skills of early childhood students. Anecdotal records show an increase in students' vocabulary related to Malangan culture.

Learning evaluations revealed the achievement of various aspects of student development. Educators noted student progress covering cognitive, socio-emotional, language, and cultural appreciation aspects. Suri & Chandra (2021) concluded that local culture-based learning supports the holistic development of early childhood students. The success of this learning has inspired the development of similar programs in other PAUD institutions.

4. Conclusion

The application of the Make a Match method based on local wisdom of Malangan in Dharma Wanita Kindergarten, Malang Regency has succeeded in transforming numeracy learning. The success of this learning shows an improvement compared to the conventional approach previously applied, where students tended to be passive and less involved in the learning process. The enthusiasm of students was

clearly visible when participating in learning that integrated local cultural elements such as the Malangan Mask and batik motifs in numeracy materials, in contrast to conventional learning that only used standard learning media. The creativity of educators in developing culture-based learning media, strengthened by active collaboration with local artists, created meaningful learning experiences that supported the cognitive, social-emotional, and cultural appreciation development of students.

Although there were obstacles such as limited preparation time and cultural references that were appropriate to the characteristics of early childhood learners, the support of the principal and the involvement of the surrounding community helped overcome these challenges. Recommendations for program development include ongoing training for educators related to the integration of culture into learning and the preparation of a local cultural database that has been adapted for early childhood learning. The success of this method provides inspiration for the development of local wisdom-based learning in other PAUD institutions.

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