

Design and Development of Engklek Mat Learning Media for Early Childhood Motor Stimulation

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Abstract

PAUD (*Pendidikan anak Usia Dini*/Early childhood education) requires varied and engaging media to optimally stimulate children's development, yet the availability of media that integrates gross motor, cognitive, language, and socio-emotional aspects remains limited. This study aims to develop an interactive learning media in the form of a hopscotch mat to stimulate gross motor skills in children aged 4–6 years while introducing traditional games. The research used the Research and Development method with the ADDIE model, covering the stages of Analysis, Design, Development, Implementation, and Evaluation. Data were collected through interviews, observations, literature study, and documentation at PG & TK Islam Nurul Hasanah, East Jakarta. The results show that the hopscotch mat media was successfully developed by adapting the traditional games of *engklek tapak gunung/tapak bulan* and *engklek geser*. The design uses bright colors, representative illustrations, and 30×30 cm squares according to the characteristics of early childhood. A trial with 20 students in Class B Kindergarten showed that students participated enthusiastically and orderly, and achieved developmental indicators in art, language, cognitive, physical-motor, and socio-emotional domains. The study concludes that the hopscotch mat media is suitable for use as an effective early childhood learning media that increases children's learning interest and contributes to local cultural preservation.

Keywords: Interactive Learning Media, Hopscotch Mat, Traditional Games, Gross Motor Skills, Early Childhood

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1. Introduction

Learning media are tools that play an active role in the implementation of teaching and learning processes at school, making it easier for teachers as educators to deliver material to students as learners. According to Ningsih, learning media are tools for conveying messages through various channels aimed at stimulating the thoughts, feelings, and willingness of learners. [1]

Learning media should be an intermediary tool that is appropriate to the material being taught, attractive, and enjoyable. If the learning media presented by the teacher can be well received by students, then the material delivered can be understood and absorbed effectively. Learning media function as communication tools that make the educational process more engaging and less monotonous when utilized effectively by teachers [2].

Learning media help attract students' interest in learning, increase curiosity that will later motivate learning, and provide variation in teaching so that both teachers and students do not feel bored and

monotonous. This is because media in an activity can be defined as anything that can be used to convey messages or lesson content [3]. Early childhood education provides stages of stimulation to stimulate children's physical growth and development. Considering that early childhood is in the golden age period, they need the assistance of teachers or adults in developing the aspects of their developmental stages [4].

The concrete thinking of early childhood means that all forms of learning activities must use real objects [5]. That is why teachers need to fully understand the effect of providing stimuli on children's creativity [6]. One of the developmental aspects prioritized in early childhood education schools is providing stimulation for both fine and gross motor skills, both at home and at school. Stimulation of fine and gross motor skills can help children perform activities better, especially when socializing with peers. If a child experiences a disruption in motor development, the child will tend to have difficulty understanding and moving. This is why children aged 3–4 years need learning media that can stimulate visual, auditory, and motor abilities [7].

Stimulating children's motor skills at school can be done through activities that match the given stimuli, as well as the help of creative and engaging media. The media created can utilize many ideas, one of which is by adapting traditional games. The model of traditional games, besides being an invaluable ancestral heritage, also greatly helps children's growth and development period to proceed optimally[8]. By applying unique and attractive designs, visual communication design plays a strategic role in facilitating the preservation of local culture through educational media that is interesting and contextual [9]. For this reason, the design of learning media is an important component in improving the quality of teaching and learning[10]. School, as the second place of education after home for children, also introduces Nusantara culture to children to teach a sense of affection and appreciation, as well as the spirit of nationalism as early as possible. One of the traditional games that can be utilized and adapted is the traditional game of *engklek* (traditional hopscotch game).

The traditional game of *engklek*, also known in some regions as *tapak gunung*, is played by hopping on one or two feet over a pattern drawn on the floor or ground. The characteristic of *engklek*, which involves hopping on a drawn pattern, can help train children's muscles, especially in the legs, and improve concentration by following the pattern while jumping. This game stimulates children's movements and trains body coordination, thereby directly developing gross motor skills that are useful for daily life [11]

The combination of hopping and jumping movements in the traditional game of *engklek* can also be linked to foot agility, since shifting positions requires transitioning from support on one foot to support on both feet [12]. Because gross motor movement in children involves the activity of the hand, leg, and entire body muscles, the traditional game of *engklek* can therefore improve gross motor skills, particularly body balance[13].

Based on the description above, the research problems in this study are; first, how to design learning media that aligns with the material needs and simultaneously stimulates the development of fine and gross motor skills in early childhood students. Second, how the traditional game of *engklek* can be effectively implemented in learning media and compared with the teaching material, and used to achieve the program goals of early childhood education, namely stimulating fine and gross motor skills. Furthermore, the study explores how *engklek*-based learning media can attract children's attention and focus during learning activities at school and achieve learning objectives in the areas of Art, Language, Knowledge, Psychomotor, and Affective development

Based on the research problems outlined above, this study focuses on developing learning media design by adapting the traditional game of *engklek*, also known as *tapak gunung*. The design developed from this traditional game is expected to provide teachers with an example of how to create learning media by utilizing existing culture and media for teaching and learning purposes. It aims to produce media that is aesthetic, engaging, functional, and contributes to cultural preservation, so that students can gain more optimal learning experiences and socialization experiences.

2. Method

This study is qualitative research using a Research and Development (R&D) approach with the ADDIE model [14]. ADDIE offers a systematic and structured framework for creating effective and efficient learning media [14]. This method was chosen because the researcher will develop a product and test it to determine whether the product is feasible for distribution. In R&D, methods or steps are used to create new products or develop existing ones, and to test their effectiveness [15]. The ADDIE stages consist of Analysis, Design, Development, Implementation, and Evaluation. These stages were chosen to produce a systematic learning media design, starting from needs analysis to evaluating the effectiveness of the designed media. The ADDIE development model is an effective approach for designing and developing quality learning experiences [16].

The research subjects are early childhood students at PG & TK Islam Nurul Hasanah, East Jakarta, aged 4–6 years. Every child in kindergarten is expected to receive appropriate education and stimulation to optimize their development and abilities in the future [17]. This study also involves teachers from the school who will become the direct users of the designed media. The research focuses on stimulating children's fine and gross motor skills during learning activities at school with the teacher, based on the provided teaching materials. Teachers can plan and implement creative, innovative, and engaging activities for children before starting the learning process[18].

Data were collected through interviews, observation, literature study, and documentation. Selecting data collection techniques that align with each variable facilitates the data collection and analysis process, and ensures that the information obtained is relevant and accurate to the research objectives[19].

Interviews were conducted with the principal and early childhood teachers to obtain information regarding the material to be taught and the expected outcomes. Observations were carried out to examine the number and condition of students, including the presence of children with special needs such as ADHD, learning

difficulties, and speech delay. The classification of special needs students at this school was considered so that the interactive learning media developed could help teachers deliver the material, since children with special needs require educational services tailored to their individual learning needs [20]

A literature study was conducted to find references on learning media suitable for early childhood, as well as appropriate design elements such as color, typography, shape, and illustration. The literature was also used to understand how the traditional game of *engklek* can serve as inspiration for developing learning media. Documentation was carried out in the form of activity photos, video recordings, and student learning outcomes.

Based on the data collected, the development of the learning media followed the ADDIE model stages. This model provides a systematic framework suitable for developing learning media adapted from the traditional game of *engklek*. The stages are described as follows:

1. Analysis: Identifying learners' needs, student classifications in the school, and the material to be used in developing learning media that adapts the traditional game of *engklek*.
2. Design: Creating the design for the *engklek* mat learning media, adjusting illustration elements, typography, color, and activities suitable for early childhood based on the learning material.
3. Development: Adapting the traditional game into the *engklek* mat learning media and determining the activities children will perform while using the media.
4. Implementation: Conducting trials of the designed learning media to observe children's responses when using it.
5. Evaluation: Assessing the feasibility of the media through validation by media experts and subject matter experts in learning media.

Feasibility data were obtained from validation questionnaires completed by subject matter experts and media experts using a 4 - point Likert scale: 1 = Not Feasible, 2 = Less Feasible, 3 = Feasible, 4 = Very Feasible. The feasibility categories were determined based on the average score as follows: 3.26 – 4.00 = Very Feasible, 2.51 – 3.25 = Feasible, 1.76 – 2.50 = Less Feasible, 1.00 – 1.75 = Not Feasible

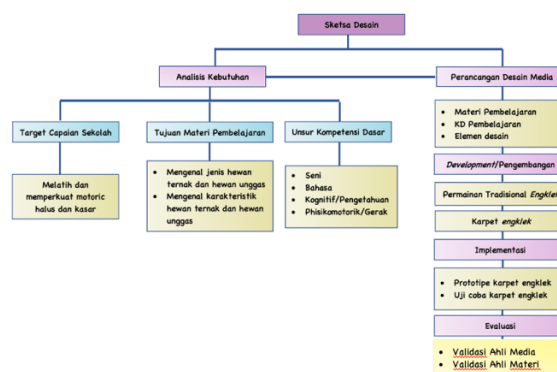


Fig. 1. The Design Workflow for the Engklek Mat Learning Media Using the ADDIE Approach

Upon completing the data collection stages within the ADDIE model, the researcher proceeded to develop the *engklek* mat learning media through three sequential phases: Pre-design, Design, and Post-design. This framework provides a concise yet adaptable structure, making it suitable for the development of instructional media and materials. [21].

- a. Pre-design: The initial stage of designing the learning media by aligning design ideas with the concept of the traditional game *engklek*, compiling references and a mood board, and selecting supporting materials for the media.
- b. Design: The design stage involves determining the dimensions of the mat, the type of *engklek* game to be used, and selecting design elements such as illustrations, color, typography, and the digitization process using Adobe Illustrator. The use of color is not only intended to create contrast and harmony, but also to establish a cheerful atmosphere appropriate to the characteristics of early childhood [22]. Meanwhile, the illustrations on the mat are simplified into patterns and shapes familiar to children. These illustrations function to support the formation of children's visual memory, enabling visual information such as patterns and movements in the game to be retained and to facilitate understanding of the game's sequence and problem-solving during play [23].
Typography employs large sans-serif fonts with wide letter spacing to ensure readability for children aged 4–6 years. Typography serves not merely as a complementary element that explains the design concept, but also as a visual foundation that helps children understand and interact with numbers more deeply [24]
- c. Post-design: The final stage involves creating a mockup, preparing the print-ready design, and adding supporting materials for the media after the printing process.

At the conclusion of this stage, a learning media in the form of an *engklek* mat was produced through the printing process. Once the media was ready, a trial was

conducted with students and teachers at PG & TK Islam Nurul Hasanah to examine their responses and the achievement of the learning objectives.

3. Result and Discussion

3.1 Results of the Learning Media Design

The development of the *engklek* mat learning media was carried out using the ADDIE model, which was divided into three stages: pre-design, design, and post-design.

1. Pre-Design Stage

This stage includes the development of a mood board and initial sketches. The mood board serves as a visual reference for determining the fun learning design concept, characterized by vibrant colors and cartoon illustrations of farm animals and poultry, as shown in Fig. 2. The selection of colors and illustrations aims to attract the attention of early childhood learners. Accordingly, the mood board consists of various image clippings, photographs, colors, textures, and other visual elements arranged to provide inspiration and visualize an idea [25]

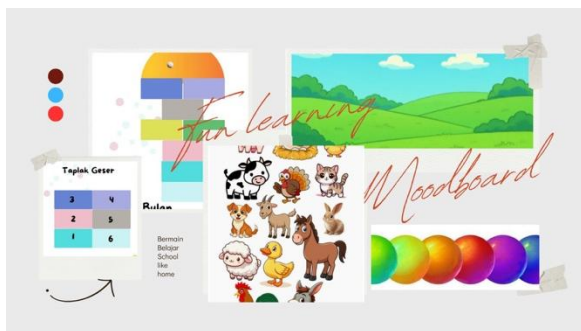


Figure 2. Mood board for the design of the *engklek* mat learning media

Based on the mood board, initial sketches of the learning media were developed to serve as the foundation for designing the *engklek* game pattern. The sketches function to visualize the initial idea before moving on to the digitalization stage [26]

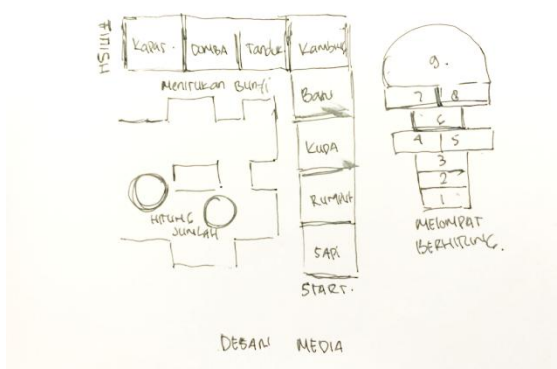


Figure 3. Sketch of the Engklek Mat learning media design

2. Tahap Design

Sketsa kemudian didigitalisasi menggunakan Adobe Illustrator dengan penambahan elemen warna, tipografi, dan ilustrasi hewan. Desain yang matang dapat meningkatkan daya tarik visual dan kemudahan penggunaan media [27]



Figure 4. Digitalization stage of the *engklek* mat learning media design

The media incorporates supporting elements including synthetic grass, stone- and wood-textured stickers, cotton, and flat coins/stones to enhance contextual learning experiences while maintaining child safety.

- Synthetic grass: Employed as a substitute for natural grass since cattle are grazing animals. Synthetic materials are used to ensure the media remains hygienic and safe.
- Stone-patterned sticker: Illustrates the characteristic strength of horses and their ability to run on various terrains. Stickers are selected to minimize the risk of injury to children when touching or stepping on the media surface.
- Raised wood-textured sticker: Represents the visual form of goat horns. The wood texture is chosen because it resembles the shape and impression of horns, and will be combined with horn illustrations on the media.
- Cotton layering: Serves as a representation of thick sheep wool. Cotton is selected because its texture resembles wool and is safe for early childhood learners to touch
- Flat coins/stones: Function as markers on animal illustrations. Children are required to state the animal name, its characteristics, and the number of animals depicted in the image where the coin lands after being tossed



Figure 5. Digitalized sketch of the Engklek Mat learning media design

The media is produced in dimensions of 3 x 2 meters and integrates four types of games within one frame:

- a. Engklek Melompat/Hopscotch Jumping with Counting and Color Identification

Gameplay: Children hop on one foot in single squares and on both feet in double squares, starting from the start line. During the upward jump, children articulate numbers aloud. Upon landing, they identify the color of each square traversed. If a child fails to jump correctly or steps on a line, they are required to answer an arithmetic problem related to the square where the error occurred. The design is illustrated in Fig. 6.

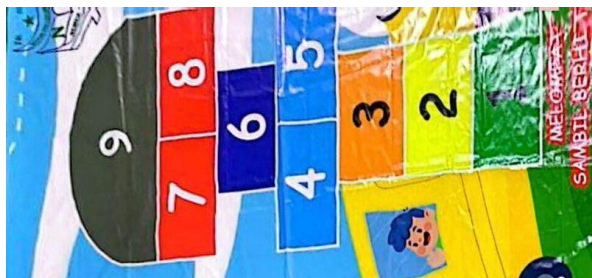


Figure 6. Engklek design for jumping while counting

- b. Engklek/ Hopscotch Naming Livestock and Their Characteristics

Gameplay: Children jump following an inverted "L" pattern while singing. Each square contains an image of livestock. After jumping, children state the name and distinctive characteristics of the animal by singing lyrics that were introduced previously.

Lyrics:

Sapi makan rumput

Kudanya berlari

Kambing bertanduk

Domba berbulu tebal

Action note:

- "Kudanya berlari" → children perform running movements in place
- "Kambing bertanduk" → children shape their hands into horns above their heads
- "Domba berbulu tebal" → children squat and touch the cotton material

- c. Engklek/Hopscotch Tossing Coins/Flat Stones

Gameplay: Children toss a coin onto the animal illustrations. Children then hop to that square, state the animal name, its characteristics, and count the number of animals in the image. The teacher confirms the answer together with the other students. The design is illustrated in figure 7.



Figure 7. Engklek game with coin/flat stone throwing

- d. Following the Line while Singing and Mentioning Animal Sounds

Gameplay: Children arrange themselves in a line to form a train and walk along the designated path. Upon stopping at the station featuring poultry animal images, children identify the animal name and imitate its vocalization while singing "Old MacDonald Had a Farm" using the modified lyrics below:

Lyrick:

Mari kita menirukan suara ayam jantan

Kukukuruyuk 3x

Suara ayam jantan

Mari kita menirukan suara unggas bebek

Kwek kwek kwek 3x

Suara bebek

Mari kita menirukan suara induk ayam

Petok petok petok 3x

Suara induk ayam



Figure 8. Line-following game

Each stop is designated as a poultry station. The teacher asks, "What does a rooster sound like?" and other students may participate in answering. In addition, each game is designed to achieve *Kompetensi Dasar (KD)* of *Pendidikan Anak Usia Dini (PAUD)*/early childhood education in the domains of arts, language, cognitive, psychomotor, social-emotional, and moral development.

3. Post Design Stage

The post-design stage represents the concluding phase in the development process of the engklek carpet learning media. This phase encompasses print design, final design, and testing/trials to verify that the media is ready for implementation with students.

a. Print Design

Print design is undertaken to ensure the compatibility of each visual element in the learning media design with the characteristics of early childhood learners. The evaluated aspects comprise the dimensions and shape of the hopscotch squares, the use of bright and appealing color schemes, representative animal illustrations devoid of abstract forms, and the clarity of the gameplay sequence for each activity type. This evaluation aims to prevent errors and confusion while minimizing the risk of injury during play. The development and refinement of the design remain the responsibility of the designer, who must demonstrate expertise, creativity, and an understanding of Indonesian cultural context and user requirements. [28]



Figure 9. Print design of the Engklek Mat learning media

In this design, the hopscotch/engklek squares are restricted to a maximum dimension of 30 x 30 cm with a maximum of 10 squares per game. This restriction is adapted to the motor capabilities of 5–6-year-old children to avoid challenges in jumping distance, fatigue, and boredom. It also aims to facilitate orderly turn-taking among children during play.

b. Final Design

Based on all phases of the design process, the final step undertaken is the production of the design into carpet media according to the following specifications:

1. Material: Heavy-duty flexy banner material that is waterproof, easy to clean, and slip-resistant to prevent children from slipping during play.
2. Size: 3 x 2 meters, incorporating 4 types of games arranged in a linear sequence to enable orderly and progressive turn-taking.

After printing, the researcher manually affixes supporting ornaments with adhesive, including synthetic grass, stone and wood motif stickers, and cotton. Before implementation with children, the researcher performs a self-trial to verify that all dimensional details and supplementary materials pose no hazard to users.

c. Testing

The learning media trial was implemented at PG &TK Islam Nurul Hasanah, East Jakarta, with the participation of teachers and 20 kindergarten B students from two classes. Throughout the activity, the children adhered to the instructions and game sequence in an orderly and enthusiastic manner under the supervision of the research team and teachers. Documentation of the trial activity is shown in figure 10.



Figure 10. Field trial of the Engklek Mat learning media design

3.2 Pembahasan

This study produced an engklek carpet learning media for early childhood that integrates visual aesthetic aspects and learning functions. The designed media is unique, attractive, full color, and enjoyable, thus it is expected to increase children's motivation in participating in learning, particularly on Basic Competency/ *Kompetensi Dasar (KD)* material recognizing animals with the subthemes of farm animals and poultry.

The use of contrasting and harmonious colors on the carpet proved to support children's visual attention. Bright colors such as red, blue, and yellow have high appeal for early childhood because their contrast facilitates differentiation of play areas. In addition, harmonious color combinations prevent visual saturation so that children can maintain focus during activities. This is in accordance with child-friendly design principles stating that color functions as an emotional stimulus to foster enjoyment and learning motivation. In the trial, children showed high enthusiasm when starting the game, indicating that the color choices effectively attracted initial interest.

Furthermore, the carpet layout that adapts *engklek tapak gunung* and *engklek geser* patterns provides a clear and predictable visual structure. The linear and repetitive patterns help children understand movement sequences and play areas without requiring lengthy verbal instructions. The limitation of box size to a maximum of 30 x 30 cm and no more than 10 boxes per game is adjusted to the gross motor reach of children aged 4-6 years. Thus, the layout serves not only an aesthetic function but also supports psychomotor and cognitive aspects, namely movement coordination, balance.

Illustrations and icons of farm animals and poultry were selected based on the principles of familiarity and shape simplification. Familiar icons from children's environment facilitate the association process between visuals and the concepts being learned, such as animal characteristics and their sounds. Shape simplification reduces visual cognitive load so that children are not overwhelmed in processing information. Texture elements such as cotton for sheep wool and wood stickers for goat horns were also added to strengthen multisensory experience. This approach supports the formation of visual memory and concept comprehension through direct interaction with the media. The developed learning media has addressed the learning objectives of Early Childhood Education/ *Pendidikan Anak Usia Dini (PAUD)* as outlined below:

- **Art Aspect:** Students sing and recognize colors and illustrative images.
- **Language Aspect:** Students sing and pronounce animal names correctly.
- **Cognitive/Knowledge Aspect:** Students are able to count and recognize farm animals and poultry.
- **Psychomotor/Movement Aspect:** Students practice jumping with good coordination.
- **Social-Emotional and Moral Aspect:** Students learn to be patient while queuing and not cutting in line.

Based on the trial results at PG & TK Islam Nurul Hasanah, students demonstrated high enthusiasm in following every instruction and game stage in an orderly manner. Overall, the integration of these visual aesthetic elements contributed to the feasibility of the learning media. Based on Table I and Table II, the average total score obtained was 3.52, indicating that the Interactive *Engklek* Carpet media falls into the Very Feasible category for use with children aged 4-6 years. Students' enthusiasm and orderliness during the trial reinforce that design considerations of color, layout, and illustrations can increase learning motivation, train gross motor skills, and support the achievement of Early Childhood Education/ *Pendidikan Usia Dini (PAUD)* basic competencies.

3.3 Expert Validation Result

After the design stage was completed, validation was conducted by two experts consisting of 1 material expert in Early Childhood Education/ *Pendidikan Usia Dini (PAUD)* and 1 media expert in Visual Communication Design (VCD)/ *Desain Komunikasi Visual (DKV)*. The expert qualifications included a minimum of a Master's degree in a relevant field and 5 years of experience in their respective fields. Validation was carried out using a 1-4 Likert scale questionnaire with indicators referring to material

aspects and visual design to evaluate the feasibility of the interactive *Engklek* carpet learning media. The validation results are presented in Table I and Table II.

Table 1. Material Expert Validation Result

No.	Aspect	Indicator	Score
1.	Material Suitability	"Farm Animals & Poultry" material aligns with PAUD 4-6 years Basic Competency	3
2.	Concept Accuracy	Animal names, characteristics, and sounds are scientifically correct	3
3.	Learning Objectives	Activities stimulate cognitive, language, and motor aspects	4
4.	Difficulty Level	Activity sequence from easy to difficult is appropriate	4
5.	Language	Instructional language is simple and easy to understand	3
6.	Material Safety	Material contains no inappropriate elements for children	3
Average Category			3.33
Category			Very Feasible

Table 2. Media Expert Validation Result

No.	Aspect	Indicator	Score
1.	Color	High-contrast color palette matches children's visual attention	4
2.	Typography	Font type and size are readable from 1-2 m distance	4
3.	Illustration	Simple illustration style matches PAUD characteristics	3
4.	Layout	Clear area division and not confusing	3
5.	Communicative Function	Visual design supports learning media function	4
6.	Design Consistency	Color, illustration, and typography elements are consistent	4
7.	Aesthetics	Attractive appearance	4

		motivates children to play and learn	
Average			3.72
Category		Very Feasible	

Based on Table I and Table II, the overall average score obtained was 3.52. This result indicates that the Interactive *Engklek* Mat media falls into the very feasible category for use with children aged 4-6 years. These findings confirm the media's readiness for field implementation after design revisions

Feedback and suggestions from the media expert and material expert were incorporated during the design revision phase before field trials. This aimed to enhance material alignment and the visual quality of the media to better meet user requirements.

4. Conclusion

This study designed and developed an *Engklek* Mat learning media for early childhood by adapting two types of traditional *Nusantara* games, namely *engklek tapak gunung/tapak bulan* and *engklek geser*. The main findings indicate that the integration of traditional games with design elements appropriate to early childhood characteristics produces media that are safe, attractive, and effective. These elements include the use of bright colors, legible typography, representative illustrations, as well as a maximum box size of 30 x 30 cm with no more than 10 boxes per game to match the jumping reach of children aged 4-6 years.

The designed media addresses the research objectives by supporting the achievement of basic competencies/*Kompetensi Dasar (KD)* in recognizing farm animals and poultry, while simultaneously training gross motor skills through jumping activities, cognitive skills through counting, language skills through naming animals, as well as social-emotional skills through turn-taking and queuing activities. The trial results at PG & TK Islam Nurul Hasanah with 20 Kindergarden B students showed high enthusiasm and orderly participation, which indicates that this media is effective in increasing learning motivation and assisting classroom management. The original contribution of this study lies in the systematic adaptation of the traditional *engklek* game into a durable, waterproof, and modular mat media, equipped with tactile ornaments to reinforce thematic content without neglecting child safety aspects.

In practical terms, this design offers a reusable and durable learning tool that reduces teacher preparation time. Theoretically, this study reinforces the finding that significant impact in learning media development can be achieved through the contextual adaptation of existing cultural games. Future studies are recommended to evaluate the effectiveness of this



media in diverse school settings and to develop a teacher's implementation guide to optimize field application and facilitate broader adoption in *Pendidikan Anak Usia Dini (PAUD)* learning

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