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NakKanak Penter Media: Introducing Numbers and Geometric Shapes to 4-5-Year-Olds

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Abstract
The challenges faced by early-age children in recognizing numbers and geometric shapes in Madura have been a significant concern. This study aims to investigate the NakKanak Penter media in stimulating the recognition of numbers and geometric shapes among 4-5-year-old children. This research falls under the category of Research and Development. The data in this research and development study comprise both qualitative and quantitative data. Qualitative data were gathered through observations, interviews, and documentation. Quantitative data were obtained from research respondents, including subject matter experts, media specialists, cultural experts, and users of educational media. The analysis of this study primarily employs quantitative data analysis. The results of this research indicate that the NakKanak Penter media, which is based on corn as the primary material, aligns with the characteristics of the research location, where corn cultivation is prevalent. This media is deemed suitable for use in introducing numbers and geometric shapes to children. This study contributes by providing the NakKanak Penter media as an alternative medium for early-age children's education in numbers and geometric shapes.

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Introduction

Madura Island possesses various potentials, including marine resources, mining products, and agricultural yields. Among these, agricultural produce, particularly corn, thrives abundantly on Madura Island. In fact, Madura Island can supply a significant portion of Surabaya's corn demand. The government is set to import 500 thousand tons of corn, and a substantial portion of it is expected to originate from Madura (Basri, 2019). Corn is a high-carbohydrate and low-sugar crop. Furthermore, various parts of the corn plant can be utilized for compost and organic fertilizer, with corn cobs or husks serving purposes in paper production, livestock feed, and fuel. Additionally, processed corn can be employed as an eco-friendly learning medium, utilizing corn waste for early childhood education.

Field investigations reveal that early childhood education institutions in Madura, especially in Bangkalan, where corn cultivation is prevalent, have not effectively harnessed corn as a learning medium for children. Early childhood education represents the fundamental education that children must receive, given that early childhood significantly influences subsequent development (Abdul Latif et al., 2021; Fitri & Abdul Latif, 2021; Latif et al., 2020; Nadlifah & Latif, 2022). Therefore, it is crucial to provide maximal stimulation (Ilham et al., 2023; Utari et al., 2023), particularly since early childhood brain development reaches 80% or more of its capacity compared to later stages (Formen & Waluyo, 2023; Salsabila et al., 2023).

However, as observed in the field, some parents still lack a clear understanding of early childhood education. Moreover, in Kindergartens located near the coastline and agricultural

areas in Bangkalan, Madura, children encounter difficulties in recognizing numbers 1-10 and basic shapes. They struggle to differentiate numbers and shapes, and the classroom environment lacks engaging teaching materials. Based on field data, it is evident that children often engage in loud conversations with their peers, pay minimal attention during lessons, and still confuse numbers and shapes when questioned.

Therefore, this research aims to develop a medium for introducing numbers and geometric shapes to early-age children. Previous studies indicate that geometric shapes can be stimulated through external stimuli, particularly with the use of media(Cuturi et al., 2022; Natacik, 2019; Perry et al., 2021). Similarly, the introduction to numbers is related to children's cognitive development, which can also be stimulated through various media (Candra, 2022; Dea & Latipah, 2017; Luh & Wahyuni, 2022; Veronica, 2018). Earlier studies have shown that drawing geometric shapes can enhance children's cognitive and motor skills (Natacik, 2019), while introducing numbers in early childhood education can utilize methods like snowball throwing (Muntari, 2019). This research, however, delves into the utilization of corn waste as a medium for introducing numbers and geometric shapes in early childhood education, presenting a novel approach to addressing the challenges in early-age number and shape recognition.

Methods

The research conducted by the researcher employs a Research and Development (R&D) approach. The research and development methodology closely relates to the field of instructional technology, where instructional technology can be defined as the theory and practice of designing, developing, utilizing, managing, and evaluating processes and resources for learning (Borg & Gall, 1983). The researcher utilizes a research and development approach following the model proposed by Borg and Gall, as this research aims to produce a product that will subsequently be evaluated for its suitability as one of the instructional media for early childhood education.

The Borg and Gall research model involves ten distinct stages: *first*, Research and Information Collecting. he initial step in this research includes needs analysis, literature review, literature study, small-scale research, and the required standard reports. *Second*, Planning. After conducting preliminary studies, the researcher proceeds to the planning stage. R&D research planning encompasses: 1) formulating research objectives; 2) specifying product specifications. *Third*, Develop Preliminary of Product. The subsequent steps involve: 1) determining the design of the product to be developed (hypothetical design); 2) product development; 3) determining the stages of field design testing. *Fourth*, Preliminary Field Testing. This step involves limited product testing, serving as an initial field test for the product design. *Fifth*, Main Product Revision. This stage entails refining the model or design based on the results of limited field testing. Sixth, Main Field Test. This phase involves broader product testing, with participation from diverse students. *Seventh*, Operational Product Revision. This is the second round of refinement following extensive field testing compared to the initial round. *Eighth*, Operational Field Testing. This stage is best conducted on a larger scale, involving multiple students in different schools. The testing and adaptability of the design involve potential product users, in this context, teachers and students in Early Childhood Education (ECE). *Ninth*, Final Product Revision. This step aims to further enhance the product under development. The refinement of the final product is deemed necessary for its accuracy. *Tenth*, Dissemination and Implementation. The research findings are disseminated through academic forums, engaging PAUD teachers as potential users of the locally-sourced Madura wisdom-based media (Borg & Gall, 1983).

Data analysis in the research and development process is conducted both qualitatively and quantitatively. The data analysis process is elaborated as follows: first, Qualitative Data Analysis. Qualitative data analysis is utilized to process validation data, including expert feedback, suggestions, and criticisms. This analysis is employed to process children's responses to the developing media. Second, Quantitative Data Analysis. Quantitative data analysis involves

calculating the percentage of responses to each statement on the questionnaire. According to Komang I Sudarman, as cited in Wanda Ramansyah's book, to calculate the percentage for each statement on the questionnaire, the following formula can be used (Ramansyah, 2018):

$$\text{Percentage of Responses} = \frac{F}{N} \times 100\%$$

Explanation:
F = Frequency of subjects choosing the alternative answer
N = Total number of questionnaire items

The results of the above calculation will be analyzed to determine the validity level of the developed media. This analysis refers to the criteria outlined in table 1.

Table 1. Conversion of Achievement Levels and Media Qualifications

Achievement	Level Qualification	Description
90% - 100%	Very High	Very suitable, no revision needed
75% - 89%	High	Suitable, no revision needed
65% - 74%	Fairly High	Reasonably suitable, requires revision
55% - 64%	Low	Not suitable, needs revision
0% - 54%	Very Low	Very unsuitable, requires revision

Result

3.1. Research and Information Collection

Madura Island possesses tremendous potential, including resources from the sea, mining, and agriculture. One of the significant agricultural products obtained on Madura is corn. Corn offers a multitude of benefits from every part of the plant. Corn can be used as a food source, livestock feed, and fertilizer. Researchers are exploring the use of corn as a learning medium. Learning materials made from local resources can also be a part of the implementation of the independent learning curriculum, where learning materials are sourced from the surrounding environment.

Local resource-based learning materials, such as corn waste, can serve as an alternative for educators to implement local resource-based materials. Corn waste-based materials can be used for teaching 4-5-year-old children about numerical symbols and shapes. The following are examples of corn waste that can be utilized as learning materials in Early Childhood Education Units (ECE).

Figure 1. Corn Silk

Figure 2. Corn Silk

3.2. Planning

Berdasarkan hasil observasi di lapangan dan melakukan kajian literatur, media pembelajaran Based on field observations and a literature review, the developed learning media consists of corn waste, including corn husks, corn silk, and corn cobs. These three materials will be

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transformed into easily usable learning media for young children. The process of creating this media should also be environmentally friendly, involving the use of plywood and wood glue. The specifications for the materials used in this learning media are as follows: Length = 15 cm, Width = 15 cm, Height = 8 cm.

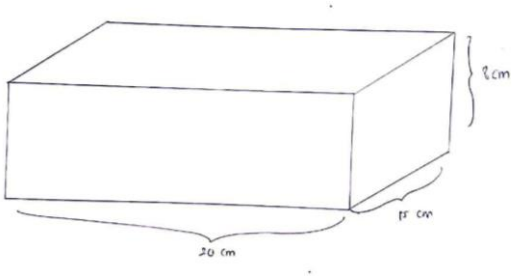

Figure 3. NaK Kanak Penter Learning Media Design

3.3. Develop Preliminary Product

The media is called "NakKanak Penter," which translates to "clever child." Its purpose is to teach children about numerical symbols 1,2,3,4,5,6,7,8,9,10 and shapes such as a circle, square, triangle, star, and rectangle. The components involved in developing this media include: first, creating a wooden media box; second, making mini cushions filled with corn silk and attached with corn leaves for numerical symbols and shapes. The detailed development of the media can be seen in Figure 4, Figure 5, and Figure 6.

Figure 4. Box Design for Nak Kanak Penter Media

Figure 5. Media Made from Corn Leaves and Corn Silk

Figure 6. Box for Teachers Containing Materials Used to Create the Media

The researcher proceeded to the next stage, which is the validation by Subject Matter Experts regarding the learning content in Early Childhood Education (ECE) units and Media Learning Experts. This research involved two types of validation: content validation and media validation. Content validation was conducted to ensure that the content aligns with the cognitive development, especially symbolic thinking, of 4-5-year-old children. Meanwhile, media validation aimed to assess the suitability of the media for instructional purposes.

3.4. Validation by Subject Matter Experts

The content validation process involved two professors: Umu Da'watul Choiro, M.Pd. from the Department of Non-formal Education at the Faculty of Education, State University of Malang, specializing in early childhood education, and Novianti Retno Utami, M.Pd., a lecturer at PGRI University Yogyakarta with expertise in early childhood education teaching tools. The results of the validation process are presented in Table 2.

Table 2. Subject Matter Expert Validation

Content Validation Questionnaire			
Indicators	Score	Percentage	Average
Indicator 1	5	100	100
Indicator 2	5	100	100
Indicator 3	5	100	100
Indicator 4	5	100	100

Based on the results of the validation questionnaire given to subject matter experts, it is evident that the average score obtained is 5 with a percentage score of 100%. These results indicate that the content validation falls into the category of "very suitable" and does not require revisions.

3.5. Validation by Media Experts

Media expert validation is essential in this research to measure the validity of the "Na'Kana' Penter" learning media that has been developed. The media expert validator is Denok Dwi Anggraeni, an Early Childhood Education teacher with expertise in learning media. The validation results by the media expert can be seen in table 3.

Table 3. Media Expert Validation

Media Expert Validation Questionnaire				
Indicators	Score	Percentage	Average Score	Average Percentage
Indicator 1	4,17	83,33	4,13	82,67

Based on the results of the media expert validation questionnaire, both indicators obtained an average score of 4.13 with a percentage of 82.67%. These results indicate that the media is considered "suitable" and does not require revisions. Next, the analysis of children's comprehension scores is analyzed using a scoring scale as shown in table 4.

Table 4. Comprehension Score Calculation for Children

Percentage Interval (%)	**Criteria**
85 ≤ X	Excellent
70 ≤ X < 85	Good
50 ≤ X < 70	Adequate
X < 50	Less than Adequate

3.6. Preliminary Field Testing

The limited field testing has been conducted in a small class at RA Bakti Telang. The small group was chosen at this kindergarten because it is close to cornfields in the Labang Bangkalan area. The results of the limited field test can be seen in table 5.

Table 5. Limited Field Testing

Percentage (%)	**Criteria**	**Number of Children**	**Percentage**
75 < P ≤ 100	Excellent	8	53,33
50 < P ≤ 75	Good	6	40
25 < P ≤ 50	Fair	1	6,67
0 ≤ P ≤ 25	Poor	0	0
	Total	15	100%

Based on the calculations from the table above, during the limited-scale testing at ECE RA Bakti Telang, 8 children obtained an "excellent" score with a percentage of 53.33%, 6 children achieved a "good" score with a percentage of 40%, and 1 child had a "fair" score with a percentage of 6.67% out of the total number of children who participated in the small class trial. This data indicates that the majority of children were able to understand simple numerical and geometrical concepts created from corn-based materials.

3.7. Main Product Revision

The implementation of limited-scale testing has generated several suggestions for improvement. Firstly, during the trial, it was observed that the media box covers lacked stickers indicating the name of the learning media developed. This has become one of the suggestions for media improvement in future testing phases.

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3.8. Main Field Test

The next stage of testing was conducted in a medium-sized group, involving approximately 20-30 students. This second-stage trial took place at TK Dharma Wanita Persatuan Tangjung Bumi, characterized by a rural setting with a focus on agricultural products like corn. The results of this second-stage test are presented in table 6.

Table 6. Main Field Test

Percentage (%)	Criteria	Number of Children	Percentage
75 < P ≤ 100	Excellent	12	38,71
50 < P ≤ 75	Good	16	51,61
25 < P ≤ 50	Fair	3	9,68
0 ≤ P ≤ 25	Poor	0	0
	Total	31	100%

Based on the calculations from the table above, during the small-scale testing at ECE TK Dharma Wanita Persatuan Tangjung Bumi, 12 children achieved an "excellent" score with a percentage of 38.71%, 16 children obtained a "good" score with a percentage of 51.61%, and 3 children had a "fair" score with a percentage of 9.68% out of the total number of children who participated in the medium-sized class trial. This data indicates that the majority of children were able to understand simple numerical and geometrical concepts created from corn-based materials.

3.9. Operational Product Revision

In this second part of the revision process, two suggestions for improvement were identified. Firstly, it was recommended to add an aroma or perfume resembling the scent of corn to the corn silk used in the number cushions. This addition would allow children to not only recognize the taste but also the scent of corn. Secondly, during the school trial, teachers were encouraged to participate in the creation of corn-based learning media. The involvement of teachers was expected to enhance their engagement in utilizing local materials for instructional purposes.

3. 10. Operational Field Testing

The third round of testing was conducted in a large class setting, involving two different schools simultaneously. This trial took place at RA At Tahiriyah and RA Al Azhar in the Modung District, characterized by its coastal location and agricultural production of corn and beans. The results of this third-stage test are presented in table 7.

Table 7. Large Class Testing

Percentage (%)	Criteria	Number of Children	Percentage
75 < P ≤ 100	Excellent	37	82,22
50 < P ≤ 75	Good	4	8,89
25 < P ≤ 50	Fair	4	8,89
0 ≤ P ≤ 25	Poor	0	0
	Total	45	100%

Based on the calculations from the table above, during the large-scale testing at RA Attahiriyah and RA Al Azhar Modung, 37 children achieved an "excellent" score with a percentage of 82.22%, 4 children obtained a "good" score with a percentage of 8.89%, and 4 children had a "fair" score with a percentage of 8.89% out of the total number of children who participated in the large class trial. This data indicates that the majority of children were able to understand simple numerical and geometrical concepts created from corn-based materials.

Based on the data analysis from the three rounds of testing, it can be concluded that media made from corn-based materials can be used for teaching numerical symbols and shapes, which are aspects of cognitive development, particularly symbolic thinking. The results of the testing conducted in three institutions, including RA Bakti Telang, TK Dharmawanita Persatuan Tanjungbumi, RA At-tahririyah, and RA Al Azhar Kec. Modung, are summarized in table 8.

Table 8. Overall Learning Media Testing Results using Corn-based Materials

	P1	P2	P3	P4	P5	Average
Small-scale Testing	67,86	50	92,86	85,71	82,14	75,71
Medium-scale Testing	69,05	53,57	67,86	61,9	64,28	63,33
Large-scale Testing	68,12	46,87	80	78,75	80,62	70,87

3.11. Final Product Revision

The final product revision phase involved the researcher conducting a final check and finishing of the developed media. This process is also part of the quality control for media made from waste materials and wood. After finishing, the media is packaged and ready for use by educators in the ECE units.

3.12. Dissemination and Implementation

The final stage of this research involves disseminating the findings to relevant stakeholders such as ECE educators and providing guidance and tutorials on how to use this game in schools. Teachers are not only equipped with instructions on how to use the media but also provided with a kit containing tools and materials that can be used to create similar learning media.

Discussion

The research findings above illustrate that NakKanak Penter is a learning tool made from corn-based materials, utilized to stimulate children's abilities in recognizing numbers and geometry. NakKanak Penter is a learning tool created using corn-based materials. This indicates that materials typically considered as waste or useless can be transformed into effective educational media. NakKanak Penter is capable of stimulating and developing children's abilities. This includes their capacity to recognize and comprehend numerical and geometric concepts. In this context, NakKanak Penter plays a role as a tool that fosters cognitive development in children. The utilization of corn waste, which has traditionally been discarded, burned, or treated as household trash, can also be turned into environmentally friendly learning media (Ariyanto & Siswoyo, 2020). Environmentally friendly learning media will be a part of the independent curriculum, where students are not only expected to achieve optimal development but also to take responsibility for transforming resources into something more beneficial (Nurzaelani, 2017).

The creation of learning media based on local potential is closely tied to the role of teachers. The role of teachers is crucial in achieving effective learning activities. The competence of teachers in utilizing available resources has become a major challenge today, as teachers are required to have high creativity in utilizing available resources as learning materials. Teachers play a pivotal role in shaping the educational experiences of young children, particularly in ECE (H. Basri, 2021). The role of teachers in the learning process is particularly significant in early childhood education (Angkur, 2020). Unlike secondary and higher education, where students have a degree of independence in conducting their learning in the classroom, young children are like blank sheets of paper that need to be filled with positive experiences (Juhansar, 2021). Therefore, the role of teachers is paramount in supporting the growth and development of children. Teachers bear a significant responsibility in educating and nurturing children in schools. Hence, teachers must possess the competence that aligns with the educational standards in Indonesia (Wijaya, 2018).

The use of locally available learning media like corn waste has proven to enhance the cognitive abilities of young children. Based on the development and validation conducted by

subject matter and media experts, the media is deemed suitable, with room for improvement to make the application even more refined. The results of the researcher's testing also yielded ratings of "Excellent" for limited-scale testing, "Good" for main testing, and "Good" for large-scale testing. Based on the research conducted, the development of learning media using household waste materials indeed has a positive impact, allowing educators to be more creative in utilizing objects around them as learning materials in the classroom (Aslindah & Suryani, 2021).

This research provides evidence that NakKanak Penter has a positive value in the context of early childhood education. In other words, this media can be effectively used to teach children about numbers and geometric shapes, contributing to the development of early childhood education. Therefore, future research suggestions may involve enhancing this media by incorporating Augmented Reality (AR) technology, making it accessible to young children throughout Indonesia.

Conclusion

The NakKanak Penter media, made from corn husks and corn silk, proves to be an effective tool for introducing numbers 1-10 and basic geometric shapes to young children. This is evident from the results of the large-scale testing, which achieved a success rate of 75%. Consequently, this media can serve as an alternative educational tool for introducing numbers 1-10 and geometric shapes to young children, particularly in the Madura region. Additionally, it offers a sustainable solution for utilizing corn husks and silk as learning materials in early childhood education.

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