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Development of Media Matching Box to Stimulate Symbolic Thinking Skills in Children Aged 4-5 Years

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ABSTRACT

This study aims to develop Matching Box media to improve symbolic thinking skills in children aged 4-5 years at Hidayatul Islamiyah Kindergarten. The development model used in this study is Borg and Gall which has been simplified into 6 stages consisting of: Needs Analysis, Planning, Initial Product Development, Learning Media Revision, Field Testing, Final Media Revision. The developed media was validated by 1 material expert and 1 media expert before being tested on children. The trial subjects of this study were 11 children. The instruments used to collect data are learning achievement tests, and observations. the results of the learning test and pretest observation obtained a classical percentage of 72.7% Developing According to Expectations (BSH) and 27.3% Starting to Develop (MB) and the results of the study test and posttest observation obtaining a classical percentage of 90.9% could be categorized as 'Very Well Developing (BSB)' and 9.1% of children were categorized as 'Beginning to Develop (MB)'. From these results, it can be concluded that the Matching Box media is appropriate to be used to improve the symbolic thinking skills of children aged 4-5 years.

Keywords: *Early Childhood, Symbolic Thinking, Media Matching*

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INTRODUCTION

The process of acquiring knowledge and building the character of early childhood needs to be considered (Vial, 2019). Providing good and appropriate stimulation will affect every aspect of child development optimall (He dkk., 2019). Every aspect of child

development really must be considered, namely aspects of language development, physical motor, religious moral values, social emotional, artistic, and cognitive (Song dkk., 2020). The development of these six aspects must be considered for each child to reach optimal development, so that teachers and parents become responsive and innovative in providing stimulation to children to stimulate optimal development of children, because these aspects of development are mutually sustainable.

Cognitive development is one of the most important aspects of child development. Cognitive development is the process of a child's thinking and finding a solution to what he thinks (S. Wang dkk., 2019). Cognitive psychologists believe that the utilization of cognitive capacity has begun since the child uses his sensory motor abilities (Khadijah & Amelia, 2020). In PAUD children are objects that are directly related to the educational process, so that cognitive development is very important for success in school. For example grouping (Baldauf dkk., 2017; Gaylord, 2020; Yigit, 2021), knowing numbers, knowing geometric shapes, knowing size, knowing the concept of space, knowing the concept of time, knowing various patterns (Caniëls dkk., 2019), and others that can be applied in everyday life. In cognitive development in schools, teachers as educational staff who are responsible for carrying out educational interactions and cognitive development of students need very in-depth descriptions of cognitive development in their students.

The level of achievement of child development can be observed through several signs that appear in their behavior after the child's mental processes occur in cognitive development (Pfattheicher dkk., 2022). Signs that appear in cognitive development include the ability to solve problems, think logically and think symbolically (Penconek dkk., 2021). In Regulation of the Minister of National Education no. 137 of 2014 concerning Early Childhood Education Standards in the scope of cognitive development for children aged 4-5 years consisting of: 1) learning and problem solving, including the ability to solve simple problems in everyday life in a flexible and socially acceptable way and apply knowledge or experiences in new contexts; 2) think logically, covering various differences, classifications, patterns, initiative, planning, and knowing cause and effect; 3) symbolic thinking, including the ability to recognize, name, use the concept of numbers, recognize letters, and be able to present various objects and their imagination in the form of images.

There are four indicators used in this study which are in accordance with the standard level of developmental achievement of children aged 4-5 years in the scope of the development of symbolic thinking including the following (Peng dkk., 2020): (1) counting the number of objects from one to ten, (2) recognizing the concept of numbers, (3) recognizing number symbols, and (4) recognizing letter symbols.

Facts in the field based on the results of preliminary observations show that there are some children who are still underdeveloped in terms of symbolic thinking, still unable to recognize numbers and letters symbols well (Amir, 2018; Beal, 2019; Blything, 2018). Therefore, supporting media is needed in order to optimize children's cognitive potential, especially in terms of symbolic thinking. Learning in early

childhood should be given through play (Jiang dkk., 2019). Learning through play is a teaching and learning technique that impresses early childhood. Besides being done by playing, fun learning also requires interesting and appropriate media for early childhood (Salminen dkk., 2020). Media is a tool or means as an intermediary for conveying lesson material from the teacher to students (Hu dkk., 2019). Learning media is anything that is used to transmit messages from the sender to the recipient so that it can stimulate the thoughts, feelings, concerns and interests and attention of the child so that the learning process occurs. In the current era, many learning media have been used, especially learning to recognize the concept of numbers. Using learning media in early childhood will make children more interested in learning and give a pleasant impression.

Therefore the researchers designed a matching box game media in order to stimulate symbolic thinking skills in children aged 4-5 years (Bellis, 2019; Benzing, 2018). Because this media is more practical for children to use, using materials that are mild and harmless to children, play media are fun, appropriate and effective for children aged 4-5 years to play (Van Doren dkk., 2019). In line with a person's cognitive development, cognitive development occurs through three stages, namely the effective stage, the iconic stage, and the symbolic stage. The effective stage occurs at the age of 0-2 years (F. Wang dkk., 2019), the iconic stage occurs at the age of 2-4 years, and the symbolic stage occurs at the age of 5-7 years. The development of symbolic thinking in children includes the ability to recognize, name, be able to use numbers, recognize letters and be able to represent many objects and objects of their imagination. Based on the two opinions above, to strengthen children's symbolic thinking skills in terms of being able to recognize number symbols and be able to use them, therefore, children aged 4-5 years need to use media. One of these media is the matching box as a tool to stimulate the symbolic thinking skills of children aged 4-5 years with indicators (1) counting the number of objects from one to ten, (2) getting to know the concept of numbers, (3) getting to know the symbols of numbers, and (4) recognize letter symbols.

LITERATUR REVIEW

Symbolic Thinking

Thinking symbolically, it can be seen from the children's activities to get to know the concept of numbers, number symbols, letters, counting activities, mentioning, using number symbols to count, match and represent various kinds of objects in the form of pictures or writing (Gao dkk., 2021). The ability to think symbolically is one aspect that is included in cognitive development which is a very important aspect that must be achieved and possessed by children. According to Piaget, children's symbolic thinking abilities occur in the age range of 2-7 years, this period is referred to as the pre-operational stage. At this stage the child's thinking is more complex and able to use symbolic thinking (Low dkk., 2019). In symbolic thinking, the child develops the ability to mentally imagine an object that does not exist (Chen dkk., 2019). The ability to think

symbolic is the ability to think about objects and events, even though these objects and events are not physically present in front of the child.

Indicators of cognitive development

in symbolic thinking for children aged 4-5 years based on standard levels of achievement of early childhood development are (Hassan dkk., 2021): counting the number of objects 1-10, recognizing number symbols 1-10, recognizing the concept of numbers and recognizing letter symbols (Yang dkk., 2019). While the indicators of cognitive development in improving the symbolic thinking skills of children aged 4-5 years taken in this study are: counting the number of objects 1-10, recognizing number symbols 1-10, and recognizing the concept of numbers (Bai dkk., 2021). To improve the ability to think symbolically in early childhood, of course, cannot be separated from the role of educators or parents in stimulating it (Arora dkk., 2019). The stimulation that is carried out must of course be fun for children. Because of that every learning activity the role of the media is so important to convey the material that will be taught to early childhood.

Media Matching Box

Understanding Learning media can be used as anything that can be used to channel messages from the sender to the recipient so that it can stimulate the thoughts, feelings, interests and attention of students (Arocutipa dkk., 2022; Bellis, 2019). In choosing the right type of learning media, of course, the role of the teacher can never be separated (Arora dkk., 2019). The teacher must be able to choose what type of learning media will be used to convey the material that will be given to children during learning activities According to the researcher (Arora dkk., 2019), the learning media used to improve the symbolic thinking skills of early childhood is the Matching Box media.

Matching box it self is a media or educational game tool that can stimulate the development of symbolic thinking in children aged 4-5 years. In this game children will be introduced to learning activities to count many objects from one to ten, get to know the concept of numbers, get to know number symbols, and get to know letter symbols. In addition to stimulating children to have symbolic thinking skills (Bastaits, 2019; Beatty dkk., 2021), this game can also train children's fine motor skills in matching bottle caps to bottles by rotating them, and can train children's concentration to be able to coordinate eye and hand movements.

This Matching box game tool is a cardboard or box on which mineral bottles are attached. Two medium-sized cardboard boxes are wrapped in cardboard, 1 cardboard is for sticking mineral bottles on the surface, and the other 1 is used to write symbols that the child wants to match. Apart from cardboard and bottles, other tools are bottle caps which have been given the symbols of numbers 1-10, alphabet, or hijaiyyah letters on top. Later for the activity, the child can pair the bottle caps that have been given the symbols of letters and numbers.

The steps in using the matching box learning media are to divide it into three stages of indicators to be achieved, namely as follows:

1. The indicator counts the number of objects 1-10: namely by:
    a. The researcher wrote down the numbers in the first box using a marker
    b. The child must insert a straw into the bottle that has been attached to the second box with a number of numbers in the first box
2. The indicator recognizes number symbols by:
    a. The researcher introduces the symbol of the number on the bottle cap
    b. Researchers write numbers or letter symbols in the first box using a marker
    c. Children are asked to pair bottle caps that have numbers or letters adjusted to what is written in the first box.
3. The indicator recognizes the concept of numbers with the following steps:
    a. The child is asked to show which number of straws is the most between the two sets of straws
    b. Children are asked to sort the number symbols from the smallest to the largest (from numbers 1-10).

RESEARCH METHODOLOGY

This study uses Research and Development (R&D) research and development methods. Research and development (Research and Development) is a research method used to produce certain products, and test the effectiveness of these products. To produce certain products, research that is needs analysis is used and to test the effectiveness of these products so that they can function in the wider community, research is needed to test the effectiveness of these products (Sugiyono, 2013).

This research develops a product in the form of learning media, namely Matching Box media for children aged 4-5 years to improve their symbolic thinking skills according to their stages of development. Products are developed to suit the objectives (Baio, 2018; Lacey, 2022; Sari, 2020), so this development research uses the Borg and Gall development model.

Development style

The development procedure scheme used in this development research is described as follows:

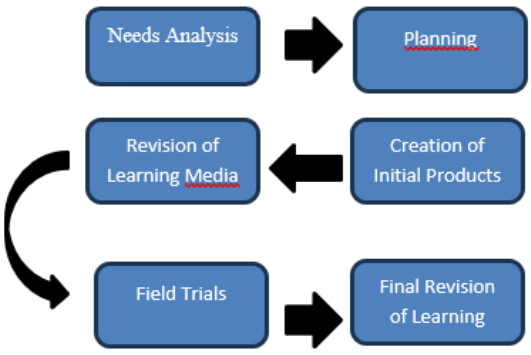

Figure 1. Schematic of the simplified Borg and Gall Model

Product Trials

Product trials were carried out aiming to collect data that can be used as a reference for determining the effectiveness of Matching Box learning media products. The learning media products need to be tested and validated first by media experts before being tested in the field with the test subjects, namely children in group A Hidayatul Islamiyah Kindergarten for the 2022/2023 Academic Year. The total number of trial subjects was 11 children.

Data Type

The data obtained in this study are in the form of qualitative data and quantitative data. Qualitative data were obtained from expert responses regarding the success and feasibility of learning media. Quantitative data were obtained from media feasibility expert scores, learning achievement tests, and observations.

Data Collection Instruments

In this development the data collection instruments were validation sheets from media experts and material experts, learning achievement test sheets, and observation sheets. Learning outcomes and observation tests contain tests and assessments to determine the effect of Matching Box media on children's learning outcomes and the effectiveness of products from children's learning outcomes and observations, especially the ability to think symbolically in children aged 4-5 years.

Data analysis technique

Data were analyzed by analyzing validation sheets, learning achievement tests and observations. The techniques for analyzing validation sheets, learning test results, and child observations are carried out by: Validation Sheets of Media Experts and Material Experts To analyze expert validation sheets, the five Likert scale formula is used to convert quantitative data into qualitative, the five Likert scale conversion tables are:

Value	Category
1	Very Poor
2	Not Good
3	Enough
4	Fine
5	Very Good

Table 1. Conversion of Quantitative Data to Qualitative Data with a Five Likert Scale

Learning Outcomes Test Sheets and Observation Sheets To analyze the learning achievement test sheets and observation sheets, the rating scale formula is used in accordance with the PAUD assessment scale, namely:

1. = Not Developed (BB)
2. ** = Start Developing (MB)
3. ***= Growing As Expected (BSH)
4. **** = Very Well Developed (BSB)

The formula used is as follows: The success of students individually, with the formula:

Percentage of individual success = $\frac{(((\text{total BSB score} + \text{total BSH score} + \text{total MB score} + \text{total BB score})))}{\text{Total number of indicatorsr}}$

Based on this formula, individual success can be grouped as follows:

Interval	category
3,50-4,00	Very Well Developed (BSB)
2,50-3,49	Growing As Expected (BSH)
1,50-2,49	Start Developing (MB)
0.01-1,49	Not Developed (BB)

Table 2. Individual Success Categories

To find out the percentage of students' success classically, with the formula:

Classical success percentage = $\frac{\text{Number of children who scored "BSB" and "BSH"}}{\text{Number of children}}$ x 100 %

Based on the above formula, classical success can be grouped as follows:

Percentage Classical Success Category	Category
86% - 100%	Very Well Developed (BSB)
71% - 85%	Growing As Expected (BSH)
55% - 70%	Start Developing (MB)
>55%	Not Developed (BB)

Tabel 3. Percentage Classical Success Category

RESULT AND DISCUSSION

Before conducting the research, the researcher carried out the stages of development namely needs analysis, planning, initial product creation, revision of learning media, field trials, and final revision of learning media. Data validation results from material experts and media experts. The data from the material expert validation results obtained a score of 33 with an average value of 3.3 which can be categorized as 'enough'. Data validation results from media experts obtained a score of 40 with an average value of 4 which can be categorized as 'good', and is suitable for retrieving data with revisions according to the advice of the Media Matching Box which has been validated by experts and then tested. This trial was carried out on 11 children in group A Hidayatul Islamiyah Kindergarten on 5 July 2023 – 9 July 2023. Data Analysis of Study Test Results using Media Matching Boxes.

This learning outcome data was obtained by conducting pretest and posttest trials in the form of assessment instruments according to indicators of symbolic thinking for children aged 4-5 years. Pretest data on individual percentages obtained are:

No	Child Name	Evaluation Score	Category

1	ADL	3,25	BSH
2	AND	2,0	MB
3	AKN	3,25	BSH
4	RM	3,0	BSH
5	RN	3,25	BSH
6	SLB	3,0	BSH
7	SL	3,0	BSH
8	HFZ	2,0	MB
9	FBR	2,0	MB
10	VR	3,0	BSH
11	FDL	3,0	BSH
	Total	30,75	

Table 4. Individual Acquisition Pretest Data

From the table above, before being given stimulation with Matching Box media, there were 8 children who were included in the developing category according to expectations and 3 children who were in the category of starting to develop in the ability to think symbolically in children aged 4-5 years which included indicators of counting many objects 1-10, recognizing the concept of numbers, recognizing number symbols, and recognizing letter symbols with a total score of 30.75 overall.

Pretest data classically obtained as follows:

Classical success percentage = $\frac{\text{Number of children who scored "BSB" and "BSH"}}{\text{Number of children}}$ x 100 %

= $\frac{8}{11}$ x 100%

= 72,7 %

From the data obtained after the trial was carried out, it was calculated using the percentage of success of students in a classical manner so that 72.7% could be categorized as 'Developing According to Expectations' with a total of 8 children and 27.3% of children categorized as 'Beginning to Develop' with a total of 3 children. Observation Results of Learning Activities with Media Matching Box.

Observation data from observations during 3 meetings to improve the symbolic thinking skills of group A children at Hidayatul Islamiyah Kindergarten. The data obtained from the posttest observation results are:

No	**Name Child**	**Evaluation Score**	**Category**

1	ADL	3,50	BSB
2	AND	3,0	BSH
3	AKN	3,75	BSB
4	RM	3,25	BSH
5	RN	3,75	BSB
6	SLB	3,25	BSH
7	SL	3,25	BSH
8	HFZ	2,25	MB
9	FBR	2,50	BSH
10	VR	3,25	BSH
11	FDL	3,25	BSH
	Jumlah	35,0	

Table 5. Individual Acquisition Posttest Data

From the table above, after being given stimulation with Matching Box media, there are 3 children who are in the very well developed category, 7 children are included in the developing category according to expectations and 1 child is in the category starting to develop in the ability to think symbolically in children aged 4-5 years which includes indicators of counting many objects 1-10, recognizing the concept of numbers, recognizing number symbols, and recognizing letter symbols with a total score of 35.0 overall.

Posttest data classically obtained:

Classical success percentage = $\frac{\text{Number of children who scored "BSB" and "BSH"}}{\text{Number of children}}$ x 100 %

= $\frac{10}{11}$ x 100%

= 90,9 %

The data obtained is calculated using the percentage of students' success classically so that 90.9% can be categorized as 'Very Well Developed' with a total of 10 children and 9.1% of children are categorized as 'Beginning to Develop' with a total of 1 child.

Product Revision

The next stage is product revision, at this stage the researcher uses 2 product revision steps, namely revision after product validation and revision after field trials. The following is the explanation: Revisions After Product Validation Matching Box media products are generally declared 'good' by the expert team (validator), which means that the product being developed is suitable for use, but there are several

suggestions for improvement from the validator. Media Matching Boxes that are revised at this stage, namely: the boxes should be put together, not separated, then use glue that really bonds between the box and the used mineral water bottles so they don't come apart easily. Revision After Field Trial At the time of field trial there were several obstacles or findings that emerged, namely the letters A-Z, numbers 1-10, and other symbols on the bottle cap had to use printed writing so that the symbols were not confused, so that children were also not confused because the handwriting was not neat.

Picture 2. Media Matching Box

CONCLUSION

Media Matching Box to improve the symbolic thinking skills of children aged 4-5 years was developed using research and development methods. Data from expert judgment validation results from 2 validators, namely material experts and media experts. The data from the material expert validation results obtained a score of 33 with an average value of 3.3 which can be categorized as 'enough'. Data validation results from media experts obtained a score of 40 with an average value of 4 which can be categorized as 'good', and is suitable for retrieving data with revisions according to suggestions.

The results of observations before being given stimulation with Matching Box media showed that 8 children were included in the developing category according to expectations and 3 children were in the category starting to develop in the ability to think symbolically in children aged 4-5 years which included indicators of counting many objects 1-10, recognizing the concept of numbers, recognizing number symbols, and recognizing letter symbols with a total score of 30.75 overall.

From the data obtained after the trial was carried out, it was calculated using the percentage of success of students in a classical manner so that 72.7% could be categorized as 'Developing According to Expectations' with a total of 8 children and 27.3% of children categorized as 'Beginning to Develop' with a total of 3 children. Observation Results of Learning Activities with Media Matching Box.

The data after being given stimulation with the Matching Box media showed that 3 children were included in the very good developing category, 7 children were included in the developing category according to expectations and 1 child was in the starting to develop category. The data obtained is calculated using the percentage of students' success classically so that 90.9% can be categorized as 'Very Well Developed' with a total of 10 children and 9.1% of children are categorized as 'Beginning to Develop' with a total of 1 child.

Based on the research results of Matching Box media to improve symbolic thinking skills, it can be concluded that the media is Valid and Effective for the Development of Matching Box Media in children aged 4-5 years in Hidayatul Islmaiyah Kindergarten

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