The utilization of local bamboo based materials for innovation of playing and creating media in children age of preschool

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Abstract. Play is one of the right stimulations for children to stimulate thinking power, to empower emotional, social, and physical aspects. There are several types of games that shape the skills and creativity of children, one of which is a game of compiling puzzles, because playing puzzles can coordinate the movements of the eyes and hands of children or fingers movements, with it without them knowing that the fine motoric skills of the child continue to be trained and developing. This paper was on addressing the problems encountered in the Amongsiwi playgroup, Panggungharjo village, Bantul, namely the lack of availability of play and creative media. The purpose of the paper is on method to create a play and creative media innovation from local materials in the form of puzzle Cendani bamboo that is feasible, safe, and environmentally friendly for preschoolers. The research was conducted by collecting data, observing and analyzing problems, product design and product testing (testing on children). The results of the study indicate that the design of play and creative media can be accepted by children with a feasibility level of 78 %. The level of ability of children to use or to compile a puzzle to form a shape based on observations was 76 % of 22 children can already be in the form of tangible shapes such as animals, cars or robots.

1. Introduction
Early Childhood Education (PAUD) is an effort to foster children from the age of birth up to the age of six years which is carried out through the provision of educational stimuli to assist in physical and spiritual development and growth so that children have readiness to enter the world of further education. Play activities are the world of children, therefore by playing can provide benefits to help the child's development. Development which is assisted by play activities for children includes: language development, moral development, social development, emotional development, cognitive development, physical development and creativity development. In the game it is usually a busy life that is chosen without any element of coercion, without being pressured by a sense of responsibility. In a game the goal lies in the game itself which is achieved within a certain time. Children like to play because in themselves there is an inner urge and the urge to develop themselves. Play is a "job" that is very time-consuming and is often done by children. Therefore, it cannot be denied that "the world of children is a world of entertainment (games)". Play is a term used freely so that the meaning of its essence is lost. This means that in every play activity carried out for pleasure without regard to the end result. That is why playing is said to be an inclusive and inherent activity, which arises on the basis of motivation from within and does not need to be taught anymore. Games are also one of the dominant forms of social activity in early childhood. Because, children spend more time outside the home to play with their
friends than involved with other activities. Therefore, games for children are a form of activity fun done solely for the activity itself, not because you want to get a result from the activity. This is because for children the process of doing something is more interesting than the results it will get [1]. With games, parents can incorporate elements of education in them when children play. Indeed, pre-school is a period of play, so it is appropriate if learning at an early age is done by playing while learning and learning while playing [2]. Play is important for children, because play is a very important part of the child's growth and development process, and with play activities, children will learn various things about daily life. Children will get experiences related to their environment, both the socio-cultural environment, the socio-economic environment, and the physical or natural environment, which is very useful for improving language skills, thinking, acting, socializing, working and so on. So we need to realize that the world of children is a world of play and children develop by playing. Therefore, it should not be deprived of playing time from their lives. Broadly speaking, the game has a cognitive, social and emotional urgency. Cognitive urgency, games can help children's cognitive development. Through games, children explore their environment, learn about the objects around them, and learn to solve the problems they face. There are several main things that affect the development process of children which are interrelated to each other, namely biological processes, socio-emotional processes and cognitive processes. In all three of these things will influence each other throughout human life, and in children it is possible it will face a variety of problems that hamper during the process of further development. Gross motor and fine motor [3].

In this globalization era, all human activities are unlimited and full of competition, so we need qualified people so that individuals can survive with their lives, one of which is to have creativity. Therefore, the creative contribution of Indonesia's young generation plays an important role, because creativity enables people to improve their quality of life to meet the needs of qualified young generation of Indonesia who are able to compete with other countries. This is important because Indonesia is low in creativity, according to Global Creativity Index (GCI) data in 2015 ranked Indonesia as 115th out of 139 countries [4]. For this reason, in this research design of puzzle game forms made from environmentally friendly materials, bamboo, to help develop children's creativity from an early age by playing and creating independently or in groups. Furthermore, the expected benefits with the results of this learning media design can also complement children's media facilities in playing and creating. The use of environmentally friendly materials namely bamboo because it is one of the natural resources that is widely used by the community because it has beneficial properties namely strong, straight, flat, hard, easy to divide, easy to shape, easy to work and easy to transport. In addition, the price of bamboo is relatively cheap compared to other materials because it is often found around settlements, especially in rural areas. Bamboo is a multipurpose plant for most people in Indonesia, it is estimated that there are at least 159 species of bamboo in Indonesia and 88 of them are endemic species of Indonesia [5]. The government encourages the use of bamboo as a commodity that provides added value to accelerate the growth of the national economy, especially based on democracy. The Director General of International Industrial Cooperation at the Ministry of Industry said that Indonesia is the third largest bamboo producing country in the world, but the utilization and export of the commodity has not been maximally managed [6]. With educative media in the form of puzzles made from bamboo material that is expected to help children develop themselves to achieve optimization of all aspects of development, both physical development and psychomotor development. Some potentials in children are cognitive potential, language, socio-emotional and physical abilities. Early childhood instinctive characteristics, both physically, socially, morally and so on. Characteristics in early childhood include: a) have a great curiosity, b) is a unique person, c) likes to fantasize and imagine, d) the most potential time to learn, e) shows an egocentric attitude, f) has a range of power short concentration, g) as part of social beings [7].

In Indonesia, 5 to 10% of children are estimated to experience general developmental delays (global development delay) and an estimated 1-3% of children under 5 years of age experience general developmental delays [8]. One component of child development is creativity, in the current era of globalization all human activities are not limited by the region and are full of competition, for that children's development especially creativity needs to be trained from an early age. The most rapid stage
of human development during the golden age is at the age of 0-6 years [9]. Stages of child development at this age are shown in Table 1, which are the stages of development which are important components in children's cognitive development [10].

| Period          | Age (year) | Description of Maturity                                                                 |
|-----------------|------------|-----------------------------------------------------------------------------------------|
| Sensorimotor    | 0 – 2      | Children's knowledge is obtained through physical interaction, both with people or objects (objects). The new schemes form simple reflexes such as palpating, grasping and grasping. |
| Preoperational  | 2- 7       | Children begin to use symbols to represent the world (environment) cognitively. Symbols are like words and numbers that can replace events and activities (visible behavior). |

Educational game tool is a game tool that contains educational value according to the age and level of development of children that serves to stimulate the physical, language, cognitive and social development of children so as to optimize children's development. Learning by using educational toys (puzzles) well and regularly their cognitive development can develop well and quickly because it is assisted with games as a learning tool for children [11]. Playing at preschool age has been shown to be able to improve mental development, intelligence, and thought ability of children aroused to utilize emotional, social, and physical aspects [12]. Early childhood plays a very important role because the development of the human brain experiences a leap and very rapid development of 80%, the rest develops until the age of 18 years, therefore to optimize the development of children needs to be given appropriate stimulation in all aspects of development [13]. Playing puzzles also affects the fine motor development of preschoolers, because playing puzzles can coordinate the movements of the eyes and hands of children, so that unconsciously their fine motorcycles continue to be trained and developed. Besides that, playing puzzles for children can train to recognize shapes and think about how to arrange puzzle components to form a certain shape or shape.

2. Research methods
The initial step of the study began with a survey in the Amongsiwi play group (PAUD), Bantul to find out the existing problems regarding educative media. Based on field surveys educational media is needed through playing and creating, for this reason, research is carried out with the Borg & Gall Research & Development method [14]. This method is a research method that produces a product and then tested to determine the effectiveness of the product produced [15]. Thus in this development research the process of planning, development and validating whether the products produced can function and can be well received. The product designed is a learning medium for playing and creating puzzles in the form of bamboo. Bamboo is formed components that can be arranged to form a shape, for example: plants, animals, cars and others. Furthermore, the products produced are assessed by material experts about educational media products and observations directly during the activities of students playing and creating as well as questionnaires / evaluation sheets with interviews to students who are accompanied by teachers and parents / mentors. "Retrieval of data using a questionnaire or questionnaire is a data collection technique by giving a set of questions or written statements to respondents to answer" [15]. The analysis technique in this research is quantitative descriptive. The result data from this research in the form of an assessment by material experts on the quality of the product which has been developed in terms of various aspects assessed, by calculating the average score of assessment using the following formula [16]:

\[ X = \frac{\Sigma X}{n} \]
Information:
\[ X = \text{Average score of each aspect}; \]
\[ \Sigma X = \text{Number of scores for each quality aspect}; \]
\[ n = \text{Number of assessors} \]

Change the average score obtained into a qualitative scale value according to the criteria (table 2).

| Value | Interval | Category | Conversion |
|-------|----------|----------|------------|
| 4     | 3.25 ≤ X ≤ 4.00 | Very Good | Feasible   |
| 3     | 2.5 ≤ X < 3.25  | Good     | Feasible   |
| 2     | 1.75 ≤ X < 2.5  | Not Good | Not Feasible|
| 1     | 1 ≤ X < 1.75    | Not Very Good | Not Feasible|

Products that are developed in the form of educational puzzles if converted into a category of "not feasible" or a score of 1.75 ≤ X < 2.5 or 1 ≤ X < 1.75 from the material expert, then the educational puzzle must be revised. Assessment of Respondents (Students), to get data about the effectiveness of learning media in the form of puzzles generated an assessment based on the child's response using a questionnaire through interviews with students who are accompanied by the teacher. The resulting assessment data were analyzed using the Guttman Scale to determine the level of product viability. Guttman Scale Scores with Criteria 1 ("agree"), and 0 ("disagree") are calculated using the following equation:

\[ X = \frac{\text{Number of assessments for all students} \times 100\%}{\text{The perfect evaluation}} \]

\[ X = \text{percentage value of the results of the assessment} \]

Table 3. Criteria for student response categories.

| Score | Assessment Criteria |
|-------|---------------------|
| X > 75 % | Feasible           |
| X ≤ 75 % | Not Feasible       |

3. Results and discussion
Games are very appropriate stimulation for children, aspects of children's development can be optimally grown through play activities. According to experts in the field of mathematical development at the University of Chicago, Susan Levine "Children who play puzzles have better abilities related to tasks related to the ability to rotate and translate" [18]. For this reason, in this study, learning media in the form of puzzles have been made, which have been tested for the feasibility of product material by material experts, in this case conducted by the accompanying teacher, and the feasibility test for responses to the use of learning media to play and create by students who are accompanied by the teachers. The learning media in the form of puzzles from bamboo material is formed into components which, if arranged, can form a shape, for example animals, plants, toy cars, furniture and others. Bamboo puzzle material is intended as an effort to introduce local materials that are environmentally friendly from an early age, because bamboo in addition to environmentally friendly is also an easy material to obtain and often encountered. Learning media designed in the form of educational puzzles to play and be creative can help children in: a). imagined to form a structure or structure. b). arouse self-confidence and train independently to realize his imagination. c). Children can interact with their friends while playing. d). get to know and love the local ingredients namely bamboo. Bamboo is a multipurpose plant because it can be used for a variety of necessities of life, starting as food (bamboo shoots), building components, decoration, kitchen equipment, light bridges, paper making materials and furniture. In the field of education, that is to make educational media by forming components such as puzzles that can be arranged into a shape. One type of bamboo that is cendani bamboo which is formed in the form of
pieces as a puzzle component for educational media is shown in figure 1. In the design of educational puzzles through play and creativity this is also equipped with a user manual for teachers.

![Figure 1. Cendani bamboo and puzzle components (Source: Personal Documentation, 2019).](image)

3.1. Level of feasibility of learning media product quality
To determine the quality level of puzzle-shaped learning media products through play and creative activities, the product material expert is given by the accompanying teacher, and then the data obtained is analyzed using a Likert Scale, which has a range of values between 1 to 4. After the data is obtained, then the score is calculated. average assessment results using equations [16], then the data analysis results are shown in table 4.

| No. | Aspect/Indicator                              | Σ Indicator | Score Expert Material | Average | Category |
|-----|----------------------------------------------|-------------|-----------------------|---------|----------|
| 1.  | Suitability of Play and Creative Material    | 1           | 3                     | 3       | Good     |
| 2.  | Suitability of Study Media                  |             |                       |         |          |
|     | a. Regarding the shape of the puzzle component | 1           | 3                     | 3       | Good     |
|     | b. Ease of compiling puzzle component       | 1           | 3                     | 3       | Good     |
|     | c. Display component puzzle                 | 1           | 2                     | 2       | Not Good |
| 3.  | Suitability of the resulting media          | 1           | 3                     | 3       | Good     |
| 4.  | Compatibility of puzzle component size      | 1           | 2                     | 2       | Not Good |
| 5.  | Compatibility of puzzle component materials | 1           | 3                     | 3       | Good     |

**Table 4. Results of expert material validation.**

![Overall average scale : 2.71 Good](image)

After being given an assessment by the material expert (teacher assistant) on several aspects or indicators of learning media material in the form of educational puzzles that have been designed to be tested on children, overall an average score of 2.71 is obtained which means it is included in the "good" category to use. The "good" category when converted according to the Likert Scale falls into the "feasible" category for use. However, there are some indicators that are still in the category of "not good", namely regarding the "appearance of puzzle components". and the "size matching component of the puzzle" aspect. For appearance it is still with the original natural color, so it is expected that children can still be about the original color of bamboo. However, according to the advice of material experts because this
play and creative media is used by children, especially early children, there should be some colors that must be given to make it more interesting. With the provision of color can also be a means of learning about color. Furthermore, for the aspect of "the suitability of the size of the puzzle component" also included in the category of "not good: It is also recommended that the size of the components be enlarged so that children are easier to arrange. Of the two aspects that are still lacking, if it is corrected, it is expected to be able to improve the indicator scores of both aspects.

3.2. Eligibility level based on user response

With this puzzle game can also foster a sense of togetherness, practice strategy in groups, can practice solving problems together among students, can foster mutual respect for fellow students and can entertain in the classroom [19]. For that learning media produced in the form of educational puzzles after being tested on children, it is necessary to test the feasibility level, where feasibility studies are often used in the context of the product development process [20]. Data on the level of eligibility based on the results of the respondent's test that the children accompanied by the accompanying teacher obtained the results as shown in table 5 below:

Table 5. Student response data on educative puzzle media.

| No | Aspect assessed                 | Total Student Response | Score 1 | Score 0 |
|----|---------------------------------|------------------------|---------|---------|
| 1. | Types of learning media         |                        | 17      | 5       |
| 2. | Ease of use                     |                        | 17      | 5       |
| 3. | Student interest in product     |                        | 18      | 4       |
| 4. | Student success rate            |                        | 19      | 3       |
| 5. | Level of understanding of material |                    | 16      | 6       |
| 6. | Material for manufacturing product |                    | 16      | 6       |
|    | Number                          |                        | 103     | 29      |
|    | Percentage (%)                  |                        | 78 %    |         |

Based on students' responses after playing and creative activities using instructional media in the form of educational puzzles for 22 students the assessment score given by the student is scored 103, the score that states agree from the maximum score of 132 if the student states agree all with the highest Likert Scale 4. The score scores are obtained at 103, after being tested the result is 78% and this value is already above 75% which is the eligibility limit based on Guttman Scale. Thus the learning media in the form of educational puzzles are designed to fall into the "Decent" category to be used by students for play and creative activities which are expected to help children develop both cognitive and psychomotor. Furthermore, during play and creative activities, observations were made which turned out to be the response of the research object, namely the students, really enjoyed and were enthusiastic enough to express their imagination by constructing puzzle components to form a shape. Students are active and motivated to try out product shapes and are challenged in playing the puzzle game. This shows that in testing the implementation of the use of instructional media in the form of educational puzzles get a "positive" response from students. Furthermore, educational games in the form of educational puzzles according to research that have been done are said that the use of educational toys appropriately can help the development of children with special needs [21]. In the use of local materials in the form of bamboo to make learning media in the form of puzzles as well as a means of introducing environmentally friendly materials to students in their manufacture requires a degree of precision. This level of precision is in terms of shape and size so that the components of the puzzle can be arranged easily and precisely and strongly with each other. With the design of instructional media in the form of educational puzzles, it can be made various forms of products and this motivates children to be creative by trying to connect from each puzzle component to form products according to their imagination. Children enthusiastically create and imagine to shape simple to complex shapes depending on the level of intelligence of each child. In Figure 3 shows the activities of children in expressing imagination by compiling a puzzle, some are active independently but some are interacting with each other.
Figure 2. Play and creative activities in Amongsiwi learning groups (PAUD) (Source: Personal Documentation, 2019).

Figure 3. Some forms of products produced by students (Source: Personal Documents, 2019).

4. Conclusions
The use of bamboo as material for making learning media in the form of puzzles through play and creative activities can be well received by preschoolers. By playing and being creative, children can train to express their imagination, train patiently, train, communicate with friends and teacher assistants and train independence. The level of success of children in playing and creative activities for most of the children succeeded in compiling components of puzzles that have been completed that are obvious defined including the shape of animals, cars, robots or others. This relates to the children's cognitive and psychomotor, must be done it will help the child's development in creating.

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