Developing Learning Models to Increase Higher Order Thinking Skills in Early Childhood

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This research is based on the needs of teachers and parents for a concrete learning model, especially in regards to the implementation of the 2013 Early Childhood Education Curriculum. This is so that children can find, process and inform the results of their learning outcomes, have soft skills, and be creative in solving their daily problems by using high thinking skills. This paper seeks to develop a relevant and effective learning model to enhance children's high order thinking skills based on open ended play. This paper employed Borg and Gall's model which was adjusted into seven steps, including research and data collection, planning, development of product drafts, initial field trials, revising trial results, field trials, refinement of field trial results. The subjects were involved in product evaluation, small group trials, and big group trials. The research results confirm that the developed learning model is relevant, effective, and valid for 5-6 years old children.

Keywords: *high order thinking skills, learning model, early childhood*

Introduction

In recent times, the development of Early Childhood Education has come to the second phase: the phase of quality improvement to prepare outstanding and qualified human resources (Dini, 2015). Outstanding and qualified human resources should be knowledgeable and able to compete. Thus, early childhood education should develop attitude, behaviour, knowledge, and skills. Attitude and behaviour development are directed to enable executive function, which is marked by (1) the ability of memory to manage different information in a relatively short time; (2) the mental flexibility to respond to different demands in a relatively short time, (3) and the self-control to determine priority and reject certain responses. Conceptual knowledge development enables creative ability by employing high order thinking skills. Children thinking development could be enhanced by habituating children and providing a scientific approach learning (Sada, 2019; Sequeira, 2012; Surahman, Wedi, Soepriyanto, & Setyosari, 2018; Vidergor, 2018; Yen & Halili, 2015; Zulfin, Shofiatun, Helmi, & Jupri, n.d.).

The results showed that the application of early childhood learning with a scientific approach was not optimal. The ability of teachers to plan and implement scientific learning only reached 65% (Sutama, 2016). On the other hand, the teachers have received a lot of training, technical guidance, workshops, or received information from manuals provided by the Ministry of Education and Culture. The results indicate a low ability of children to learn by using a scientific learning approach. A child's ability to ask questions, gather information, and reason in this context is very low. Learning with a scientific approach enhances the ability to question children. However, the ability to question children is only limited to the purpose of knowing, not for understanding, applying, analysing or evaluating (Sutama, I Wayan, 2017; Sutama, 2017).

The factors that constrain teachers in planning and implementing quality learning, based on the 2013 curriculum, are the lack of intense training processes and the lack of a concrete learning model, which reflects the application of a scientific approach. As a result, children lack quality learning and lack the opportunity to develop higher-order thinking skills in learning. Children tend to learn based on the example given by the teacher. The mindset becomes convergent, and only requires thinking skills at a low level, such as remembering and recalling.

In connection with these problems, the researchers are trying to develop learning models that trigger the development of higher order thinking skills for group B children in kindergarten (children aged 5-6 years). As stated by (Thomas & Thorne, 2009), Higher order thinking (HOT) is thinking on a level that is higher than memorizing facts or repeating something back to someone exactly the way it was told to you. HOT takes thinking to higher levels than restating the facts and requires students to do something with the facts: understand them, infer from them, connect them to other facts and concept, categorize them, manipulate them, put

them together in new or novel ways, and apply them as we seek new solutions to new problems.

Based on the above opinion, children need direct interaction with learning objects, and the opportunity to manipulate them so that children can use high-level thinking skills to adapt to new situations and overcome their daily problems (Dieker, Yang, & Yang, 2016; Hu, Dieker, Yang, & Yang, 2016). Higher Order Thinking in children aged 5-6 years is realized by deep thinking activities which are also called critical thinking processes. There are six levels in Higher Order Thinking in children. (1) The first level refers to basic general knowledge and the ability of children to remember information. At this level children begin to question something so that their questioning skills develop. Children begin to observe the environment and objects in their environment and begin to involve their thought processes through memory. Children will identify, name, count and repeat. (2) The second level is knowledge-based learning. Children will be able to answer questions that require summarization of work. They will understand facts and ideas and can compare, explain and summarize the facts/ideas. (3) The third level is skill-based learning. For example, children must use their knowledge of information and skills to find solutions. Children will be able to answer questions about a story/activity that requires more thought about different choices. The child will explain why, why not, dramatize the answer, identify or relate to the character. The child will also learn new skills for application in a variety of new settings. (4) The fourth level is skill-based learning. Children will be able to answer questions that need to be included (Faridah, Siswono, & Rahaju, 2018; Zaharin, Sharif, & Mariappan, 2018).

Children will recognize similarities and differences, recognize changes in books (characters/settings), experiment with 'what if' scenarios, infer, and identify motives/causes. The child will also learn new skills for application in a variety of new settings. (5) The fifth level is an affective-based learning. Children will be able to answer questions that require opinions, assess the decisions of themselves and others, defend and criticize their choices and the choices of others. Children must be able to defend their decisions (why or why not). Children may have shifts in their way of thinking (that values, attitudes, interests can change). (6) The sixth level refers to the part of affective-based learning. Children will be able to build/demolish, design, and create answers to their own problems. Children will attend and defend their own judgment, and the actions of others (Jenkins & Andenoro, 2016; "Spatial Thinking," 2009).

With the development of HOTS-based learning models, teachers and parents obtain a reference and example of how to improve the quality of learning, so that children are truly prepared to become outstanding human resources. The development of this model is expected to be used as a reference and studied independently (self-taught), so that teachers can improve the quality of their learning in class   (Sequeira, 2012).

Method

This research aims to create a learning model for ages 5-6 years that triggers higher order thinking skills. This learning model was developed by adopting several models, namely learning with a scientific approach and the "how to Increase Higher Order Thinking model." This is consistent with what was stated by (Bennett, Borg, & Gall, 1984; Randhawa, 1973) that Educational Research and Development (R&D) is a cycle involved in developing and validating products of education.

This development is based on the needs of teachers and parents regarding a concrete learning model, especially in the implementation of the 2013 PAUD curriculum. Children are not only recipients of information, but they should be able to find, process and inform the results of their learning outcomes by using high thinking skills. It is intended to develop soft skills in children, so they can be creative in solving their daily problems (Zaharin et al., 2018).

The research and development model in Borg and Gall's opinion consists of 10 steps (Sukmadinata, 2013). These steps are; 1) research and data collection, 2) planning, 3) product draft development, 4) initial field trials, 5) revising trial results, 6) field trials, 7) refining field trial results, 8) field implementation tests , 9) improvement of the final product, 10) dissemination and implementation.

The development of learning models based on higher order thinking skills employed seven development steps: (1) Researchers collected data by observing the quality of the Lesson Plan made by the teacher and the learning situation in the classroom. (2) The researcher conducted a plan which includes the formulation of research and development objectives by looking at the needs and striving for a product design in the form of a learning model based on developing higher order thinking skills for children aged 5-6 years. (3) Researchers developed draft product designs while validating them through experts. (4) The researcher revised the product design based on the input of expert validators. (5) Researchers conducted small group trials with representative subjects of group B to evaluate products that have been developed. (6) Researchers conducted field trials (large groups) in five kindergartens in Klojen sub-district. (7) The researcher refined the product of the trial results and revised the product based on the input and results of the large group trials and documented the research process.

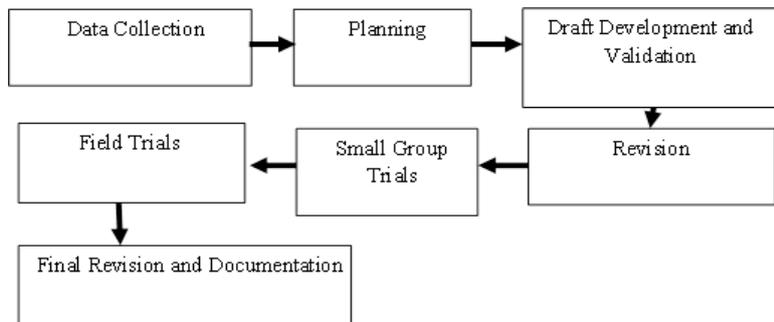The following is the procedure scheme of Unboxing Show Media Development.

Figure 1. Research Procedure Scheme of Product Development Based on Borg and Gall's Model (Bennett et al., 1984).

Product trials were intended to collect data that can be used as a basis for determining the level of relevance and effectiveness of the resulting product. The following is part of the product trial. The data in this study was obtained from the comments and reviews of experts, small group trial results, and field trial results. Before conducting trials on the subject, the learning model developed was analysed and evaluated by three experts: an expert in early childhood cognitive development, an expert in early childhood learning, an expert in learning technology.

Trials in small groups were carried out on six children of group B in five different kindergartens. This trial aimed to determine the effectiveness of the product being developed. The field trial was conducted on all Group B children in the five kindergartens. The product used in the field trial was classified as ready-to-use and perfect because it has received approval from experts and the small group trial results.

The types of data used in this development were qualitative and quantitative data. Qualitative data was obtained from expert reviews in the form of suggestions and evaluations, as well as observations and interviews in the previous research. Quantitative data was obtained from the small group trial and field trial. Data collection instruments used in this research included questionnaires, observation and interviews. The formula for processing data was in the form of descriptive percentages (Sugiyono, 2008). After the data was obtained and processed with the following formula, it was matched up with the relevant criteria in Table 1.

TABLE I RELEVANCE CRITERIA

Percentage	Qualification
85,01%-100%	Very relevant/effective/valid
70,01%-85%	Relevant/effective/valid
50,01%-70%	Less relevant/effective/valid
01%-50%	Not relevant/effective/valid

Results

The results of the validation by experts obtained that the learning model developed in this study was relevant and presumably effective to be used for children aged 5-6 years. It is shown in the following table II and III.

TABLE II EXPERT VALIDATION RESULTS ON THE RELEVANCE ASPECT

No	Aspect	Validator			∑ Score
		1	2	3	
1	Relevance with the development of children (aged 5-6 years)?	4	5	5	14
2	Relevance with the children's need	5	5	4	14
3	Relevance with children's potential	5	5	5	15
4	Relevance with children's interest	4	4	4	12
5	Able to accommodate children's interest	4	4	4	12
6	Appropriate with children's environment	5	5	5	15
7	Appropriate with the entire six points of development in kindergarten?	4	4	4	12
8	Appropriate with the entire six points of development in kindergarten?	5	5	5	15
9	Appropriate with the learning characteristics of children aged 5-6 years?	4	5	5	14
10	Appropriate with the learning principle through playing	5	4	5	14
	Total Score				137
	%				91,33

TABLE III EXPERT VALIDATION RESULTS ON THE EFFECTIVENESS ASPECT

No	Aspect	Validator			∑ Score
		1	2	3	
1	Effective to train children to learn problem solving	3	5	5	13
2	Effective to practice questioning skills in children	5	5	4	14
3	Effective to practice reasoning skills in children	4	4	5	13
4	Effective to practice communication skills in children	4	4	4	12
5	Effective to train conceptualization skills in children	4	5	5	14
6	Effective is used so that children are skilled in exploring the object of learning	4	5	5	14
7	Effective to practice critical thinking skills in children	4	4	5	13
8	Effective to trigger the development of logical thinking in children	4	4	5	13
9	Allows children to develop reflective thinking skills in children	4	4	4	12

10	Effective for developing metacognitive thinking skills in children	4	4	5	13
11	Effective for developing creative thinking skills in children	4	5	5	14
12	Effective to stimulate creativity in children	5	4	4	13
	Total Score				144
	%				80

In addition, there were several suggestions provided by the validator. (1) The hierarchy of capabilities to achieve variations in the highest level of thinking (HOTS) needs to be emphasized, so that it raises the syntax model for HOTS. Learning outcomes should be recorded with certain techniques. (2) The recalling activity is directed as a reflection activity, which refers to the learning objectives, as well as the process of knowledge construction by children. (3) Effectiveness data can be extracted from users (teachers) and students through observation when this model is tested. (3) Learning should be made simple, so it can use a simple language for the presentation. (4) Game introduction should be given beforehand.

Small group trials were conducted in five kindergartens involving as many as 6 children in group B. The five kindergartens used in the small group trial consisted of: (1) TK Negeri Pembina 1 Malang, (2) TK Aisyiyah Bustanul Athfal 17 Malang, (3) TK Muslimat NU 05, (4) TK Aisyiyah Bustanul Athfal 10 dan (5) di TK Cor Jesu Malang. The results of small group trial are presented in the Table IV.

TABLE IV SMALL GROUP TRIAL RESULTS

NO	OBSERVATION ASPECTS	OBSERVER						∑ X
		1	2	3	4	5	6	
1	The opportunity for children to learn problem-solving	5	5	4	4	5	5	28
2	Children have the opportunity to ask questions	5	4	5	4	5	5	28
3	Children obtain the opportunity to learn reasoning	5	5	4	5	5	4	28
4	Children have the opportunity to communicate learning experiences	4	4	5	5	4	4	26
5	Children have the opportunity to improve their conceptualization skills	4	5	5	5	4	4	29
6	Children have the opportunity to explore the learning environment	4	5	5	4	5	5	28
7	Children demonstrate critical thinking skills	5	5	5	4	4	4	27
8	Enable to trigger logical thinking skills in children	5	5	5	5	4	4	28
9	Enable to trigger the appearance of reflective thinking in children	5	4	4	4	4	4	25
10	Enable to trigger children to think metacognition in children	4	4	4	3	4	5	24
11	Children show the ability to think creatively	5	5	4	4	4	4	26
12	Children show the ability to create something creatively	5	5	5	5	5	5	30
total score								327
%								90,8

Based on the table above, this learning model is valid enough to be applied to children aged 5-6 years old. This is based on obtaining a validity level of 90%.

Field trials were conducted in five kindergartens involving six groups of children aged 5-6 years. In this field trial, the children involved were all children in group B. The trial results are presented in the Table V.

TABLE V FIELD TRIAL RESULTS

NO	Observation Aspects	OBSERVER						∑ X
		1	2	3	4	5	6	
1	The opportunity for children to learn problem-solving	5	4	4	5	4	5	27
2	Children have the opportunity to ask questions	4	4	4	5	4	4	25
3	Children obtain the opportunity to learn reasoning	4	4	4	4	4	4	24
4	Children have the opportunity to communicate learning experiences	5	5	5	5	5	5	30

5	Children have the opportunity to improve their conceptualization skills	4	3	4	4	4	4	23
6	Children have the opportunity to explore the learning environment	5	5	5	5	5	5	30
7	Children demonstrate critical thinking skills	4	4	4	4	4	4	24
8	Enable to trigger logical thinking skills in children	4	4	4	4	4	4	24
9	Enable to trigger the appearance of reflective thinking in children	3	4	4	4	4	3	23
10	Enable to trigger children to think metacognition in children	4	4	4	4	4	4	24
11	Children show the ability to think creatively	5	5	5	5	5	5	30
12	Children show the ability to create something creatively	5	5	5	5	5	5	30
TOTAL SCORE								314
%								87,22

Based on the Table V, the total score obtained is 87.22. This shows that this learning model is classified as very valid. The results of large group trials were lower than those of small group trials. This is due to the increasing number of children as the subject. This means that the thinking abilities of children varies despite being in the same age range: 5-6 years.

The results obtained indicate that this learning model is relevant and effective and can thus be used to improve higher order thinking skills in children aged 5-6 years. This model can facilitate children to: (1) engage in problem solving, (2) question what they learn, (3) improve reasoning, (4) communicate their learning experience, (5) improve conceptualization skills, (6) explore their learning environment, (7) improve their critical thinking skills, (8) trigger logical thinking skills, (9) trigger reflective thinking, (10) trigger metacognitive thinking, (11) creative thinking, and (12) the ability to create something creatively.

Discussion

Relevance

The results of expert validation in terms of relevance show that this learning model is in accordance with the level of development, needs, potential, interests, environment, areas of development, learning characteristics and principles of learning through play in children aged 5-6 years. (Poerwanti & Widodo, 2002; Pyle, Prioletta, & Poliszczuk, 2018) suggest that moral development in children will be in line with the development of moral reasoning which consists of moral reasoning, moral thinking, and moral judgment. (Jamaris, 2006) argues that the development of children aged 5-6 year have more coordinated movements, more active hands, more balanced feet, are able to walk on the board in a balanced manner and can jump accurately on the circle. Furthermore fine motor skills such as buttoning and painting, involve eye-hand coordination and small muscles (Messenger, 2005).

In the cognitive field, Piaget argues that at the age of 5-6 years, children's cognitive development has entered the pre-operational stage where children learn to think using inner symbols and imagery. However, their minds are still not systematic and illogical (Santrock, 2002). In addition Papalia describes the language skills of children aged 5-7 years can interpret simple words, and understand a few antonyms (Roy, 2014). The child can use several conjunctions, prepositions and articles in daily conversation. Egocentric language begins to develop more and is directed to social languages. At this age, children already have approximately 2,000-25,000 words in their vocabularies (Santrock, 2002). It is known that children aged 5-6 years enter into a period where the child's language skills begin to improve, and are capable of producing long sentences, expressing opinions with compound sentences and acquiring sufficient vocabularies. The social abilities of children are obtained from various opportunities and experiences by socializing with people in their environment.

Related to this, the learning model emphasizes active play activities. Children can express their needs and interests through play (Fesseha & Pyle, 2016; Plowman & Stephen, 2005; Wijayanto & Siradj, 2017). In addition, children can express themselves through the open-ended play process. The characteristics of games like this are more concerned with the exploration of learning objects and from their understanding will lead to a variety of questions and problems, which requires children to solve their problems with various alternatives.

Effectiveness

Reviewing its effectiveness, the expert validator argues that this model is able to be effectively applied to children aged 5-6 years. The reason for this is that it enables children to solve problems, ask questions, reason, communicate, develop conceptual skills, explore their learning objects, think critically and reflectively, develop metacognitive skills, and develop creative thinking and creativity. The development of curiosity, critical thinking skills, and creative problem solving are urgent in early childhood education. Children do not only receive learning experiences from teachers, but also are directly involved in games that trigger the development of higher order thinking skills. This is consistent with the Directorate of Early Childhood Education Development (Dini, 2015) which states that the essence and urgency of the implementation of the 2013 Early Childhood Education curriculum are directed at developing attitudes, knowledge and skills. The formation of attitudes is directed to build the ability of executive functions characterized by (1) the ability of the working memory of the brain in regulating the ability to maintain and manage different information in a short time; (2) mental flexibility that helps maintain the response of different demands in a short period of time; (3) self-control in terms of determining priorities and rejecting actions/responses (Fennema & Perkins, 2008; Riva, 2018; Temitope Favour Jiboye, 2019; Zhang, Hung, & Zhang, 2018).

Validity

Based on the results of the trial, this model is very valid and can be applied to the learning of children aged 5-6 years. In this mode of learning, children have the opportunity to explore their environment (learning objects) freely and creatively (Buzzetto-More, Guy, & Elobaid, 2007; McGee, 2006). This is in accordance with the function of Early Childhood Education to help physical and spiritual growth and development in order to prepare children for further education (Janusik, 2002; Kukulska-Hulme & Shield, 2008). In addition, Early Childhood Education teachers should change their mindset towards learning from a convergent to divergent approach. Through this learning model, children will experience the migration of thinking skills from a higher level of knowledge to the ability to create something creatively.

To help the child grow and develop optimally, the teacher should direct the child to obtain learning experiences through play that is appropriate for the level of development. The teacher must realize that the child is the subject and not the object of learning. Therefore, children must be given the opportunity to explore their learning environment, and the teacher only acts as a facilitator. A child's strong curiosity must be communicated in the form of questions. Basically, children have begun to formulate simple questions such as "what, where, why, when, who and how." Questions raised by children also reflect critical thinking, for example, "why does this flower wither and this does not?" And so on. Therefore, teachers need to give children the opportunity to ask questions about things as the object of children's curiosity.

In addition to being a form of curiosity, asking questions is also a manifestation of critical thinking. Children who are able and accustomed to thinking critically will be accustomed to posing a question. Therefore, it is strongly encouraged for teachers and parents to build a positive atmosphere for children that allow them to pose questions (Sutama, 2017).

In early childhood there is a developing interested in the surrounding environment (Crain, 2011; Hartati, 2005; Mohsen, 2016; Singh & Kalyuga, 2016). This interest is shown by reaching out and putting any object into the air. In children aged 3-4 years, in addition to often dismantling pairs of everything to meet their curiosity, children begin to ask questions in very simple language. This question is usually manifested in the words 'what' or 'why'. Therefore, teachers need to facilitate the child's curiosity, for example by providing a variety of building block toys to promote exploration activities. In addition, questions need to be answered wisely and comprehensively. Furthermore, parents and teachers can encourage their curiosity by giving a question as a response to promote a dialogue which builds a child's knowledge.

The development of curiosity, critical thinking skills, and creative problem solving are highly urgent in early childhood education. Children do not only receive learning experiences from teachers, but also are directly involved in games that trigger the development of higher order thinking skills. This is consistent with the Directorate of Early Childhood Education Development (Dini, 2015) which states that the essence and urgency of the implementation of

the 2013 Early Childhood Education curriculum are directed at developing attitudes, knowledge and skills. The formation of attitudes is directed to build the ability of executive functions characterized by (1) the ability of the working memory of the brain in regulating the ability to maintain and manage different information in a short time; (2) mental flexibility that helps maintain the response of different demands in a short period of time; (3) self-control in terms of determining priorities and rejecting actions/responses.

One attempt to achieve the objective of Early Childhood Education development is through a learning model based on higher order thinking skills. This learning model employs the flow in Figure 2.
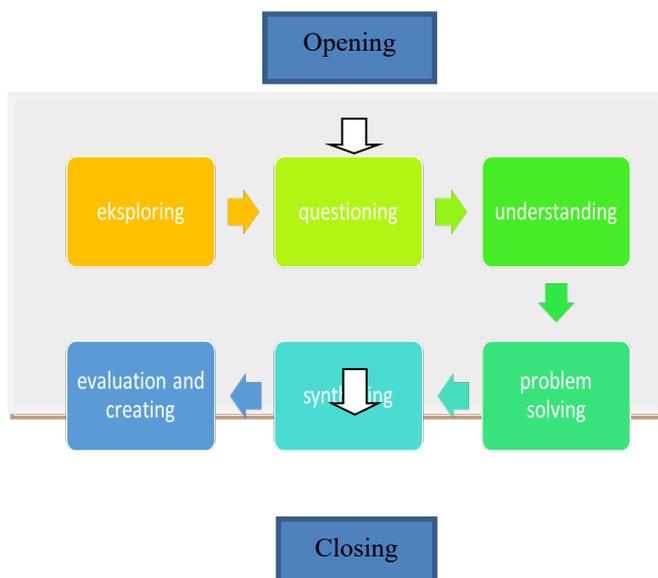

Figure 2. Learning Process

In the opening activity, children are invited to do apperception, which is linking the learning experiences they have with the themes/sub-themes that will be explored, in addition to habituation activities. In the core activities, children are invited to explore themes/sub-themes in accordance with Core Competencies and Basic Competencies and the objectives. In the exploration activities, children are given the opportunity to ask questions. Furthermore, children are directed to gain understanding through the process of gathering information in accordance with available sources and media. At the stage of problem-solving, children are invited to do open-ended play. This stage is the culmination of a child's learning activities. Children use their understanding to solve problems that occur in the game. At the synthesizing stage, children are invited to communicate their findings during play, which in turn triggers children to be creative in finding solutions to the problems they face and, based on their play experience, children can create something creatively.

To actualize the learning model, the researchers developed six examples of learning that promote the development of higher order thinking skills in children. All examples of the game are based on open-ended play. Validation test results and both trials showed that the learning model developed was very valid.

The use of open-ended play in this study is an essential finding. Open-ended play requires children to solve problems related to everyday life. This finding is in line with the opinion of (Barbarin, Murry, Tolan, & Graham, 2016; Noble, Norman, & Farah, 2005), who observed the thought process of children as migrating from level 1 to level 2, 3, 4, 5, even to level 6. At level 1, children are able to remember information and begin to question all the information they obtained. At this level, children observe their environment by involving thought processes in memory. Usually, children identify things, name objects, count, repeat, and so on. When achieving level 2, children are able to answer questions that require summarization. Children will understand what facts and ideas are, and be able to compare, explain and summarize.

At level 3, children use their knowledge and skills to find solutions. Children are able to answer questions on a story or activity with different choices. Children will explain why, why not, dramatize the answer, identify or relate to character. Children will also learn new skills to be applied in various new settings. When achieving level 4, children recognize similarities and differences, recognize changes in books (characters / settings, etc.), experiment with 'what if' scenarios, infer, and identify motives / causes.

When achieving level 5, children can answer questions that require opinions, assess the decisions of themselves and others, as well as defend and criticize their choices and the choices of others. Children must be able to defend their decisions (why or why not). Children may have shifts in their way of thinking (that values, attitudes, interests can change). At level 6, children can generate, design, and create answers to their own problems. Children will defend their own judgment and perspective, and the actions of others.

Conclusion and Suggestions

Based on the findings and discussion above: (1) the learning model based on HOTS for children aged 5-6 years is suitable for application. This is seen from the results of expert validation, which obtained a score of 91.33%. (2) The learning model based on HOTS for children aged 5-6 years is effective to apply. This is seen from the results of expert validation, which obtained a score of 80%. (3) The learning model based on HOTS for children aged 5-6 years is suitable for application. This is based on the results of small group and field trials, which obtained 90.8%, and 87.22%.

Furthermore, this study suggests that Early Childhood Education Teachers could use this learning model, which emphasizes open-ended playing to promote the development of

children's higher order thinking skills. Children should be habituated to think creatively and not linearly (all skills should be according to the example of teacher). This study also suggests that Early Childhood Education teachers innovate their learning approach and use this model as a reference in learning innovation. This research is still being tested in a limited context. Therefore, it is necessary for it to be followed up with classroom action research and / or experimental research so this learning model is truly tested in terms of relevance, effectiveness and validity.

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