

Learning Development of Problem Based Learning Model Based on Higher Order Thinking Skill on Thematic Learning of 4th Grader at Public Elementary School 1 of MerakBatin

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Abstract: This research aims to produce a product of problem based learning learning model based on higher order thinking skill on thematic learning of 4th grader at Public Elementary School 1 of Merak Batin. The total of research population was 60 learners and the sampling technique used was cluster random sampling technique, so the total of sample taken is 44 learners. Data collection techniques that used were questionnaires and tests. Furthermore, it was analyzed descriptively and tested with t-test. The research result shows that the average score of normalized N-Gain is 0,82 (high), the obtained efficiency value ratio is $1,03 > 1$ (high), attractiveness 83% (attractive) and there are significant results of average scores of posttest and pretest namely $93 > 64$ which shows that $t_{count} > t_{table}$ with score of $34,79 > 2,09$.

Key Terms: problem based learning, higher order thinking skill, thematic

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I. Preliminary

The learning process is one indicator towards the achievement of quality education. Teachers are in charge to plan and implement, as well as assess and evaluate learning outcomes. To perform all these activities, the teachers must develop learning process in order to succeed the learning and achieve the desired goals.

An educator is required to further improve their professionalism in learning, so what is desired can be achieved maximally. Professional educators are well-trained and well-educated educators with rich knowledge in their respective field, so they are able to provide optimal services for their students, that is what an educator should hold especially in thematic learning.

Learning in the classroom should not only be dominated by educators, but learners who should be more active, because it is learners who learn, not educators, so that learners are no longer as the object of learning but as the subject of learning. So, it is clear that learners who must play an active role in learning to acquire and develop their knowledge, while educators' roles are not only as the learning source but also as a mediator and facilitator in order to help optimize learners' learning process. Where in curriculum 2013, learners are required to be active in the learning process in classroom. Curriculum 2013 also requiring learning materials to be metacognitive which requires learners to not just remember and describe a taught material, but also to predict, design, and estimate.

The Observation results that made with 4th grader teachers at Public Elementary School 1 of Merak Batin, there are some problems that arise, i.e. on the used learning model, it was already using PBL learning model but less specific, teachers' lack of knowledge on HOTS-based learning that in accordance to thematic learning making it necessary to improve the learning model that has been used in order to help learners be more active in learning. Furthermore, the core activity of the teaching design made by teachers have not yet reached HOTS-based learning. Where this HOTS present in the learning activities, i.e. learners are able to think critically, logically, reflectively, metacognitively, and think creatively. While in curriculum 2013, students are required to think in high level. This is also because educators do not know about learning based on HOTS. HOTS (higher order thinking skill) is a thinking process involving mental activity in an attempt to explore complex, reflective and creative experiences that are made consciously to achieve a goal, namely to acquire knowledge that includes the level of analytical thinking, synthesis, and evaluative".

Furthermore, there is data that shows the 4th grader learners' low thematic learning outcomes in Elementary School 1 of Merak Batin obtained from scores of Mid Odd Semester Test of 2016/2017. The data shows that 40 students (37%) are categorized as unfinished (not pass), whilst 24 students (63%) are able to pass the minimum score according to the Minimum Completeness Criteria (KKM : 70). The low learning outcomes can be influenced by several factors, such as the learners' difficulty to understanding the learning in classroom,

the use of PBL learning model that not HOTS-based yet and the way the educators teach with still a monotonous manner.

Based on the above data, to achieve the desired goal, the educators' role are very important to develop a way or a process of learners' learning activity so that the school is able to provide the best services for students to produce quality children in all things. Given the development of world's science and technology and the globalization era in sight, in order to produce graduates in accordance to the demands of society, the school needs to do one of the managerial strategies to deal with currently existing problems and make a better change. Therefore, to ensure a learning process has the durability and survivability for the present and sustainability for the future, author undertake the development of learning process with PBL model based on HOTS.

PBL is a learning model that used to stimulate high-level thinking of learners in real-world-oriented situations, including learning how to learn. According to Arends (2013: 99), PBL is a learning model where learners work on authentic issues with a view to compiling their own knowledge, developing inquiry and high-level thinking skills, developing self-reliance and self-confidence.

According to Rusman (2010: 229), PBL is the use of various needed intelligences to confront real-world challenges, ability to deal with everything new and the existing complexity. PBL is a learning approach that used to stimulate high-level thinking of learners in real-world-oriented situations, including learning how to learn. Like what stated by PBL expert, Barrows, PBL is a learning model based on the principle that problems can be used as a starting point to gain or integrate to new knowledge. (Rusman, 2010: 241)

According to Kosasih (2014: 88), PBL is a learning model based on the problems faced by learners which related to the Core Competencies that being studied by learners. PBL is a student-centered learning model that oriented to a problem-solving activity by learners, after that learners seek ways to solve the problem by discussing and finding a way out through resources sharing.

The PBL model is characterized by the use of real-life problems as something that learners should learn. By using PBL model, it was hoped that learners get more skills than memorizing knowledge. Starting from problem solving skills, critical thinking skills, team work skills, interpersonal and communication skills, and information search and information processing (Amir, 2010: 35).

Based on some descriptions about PBL, it can be concluded that PBL is a learning model that exposes learners to the real world problems to start their learning activities and is one of the innovative learning models that can provide active learning conditions for learners. PBL prioritizes more about learning, where the educators task is to focus on helping learners to achieve their self-directed skills. In this model, educators serve as the problem-presenter, questioner, dialogue creator, help to find problem, and provide learning facilities. Furthermore, educators provide supports that can enhance the inquiry and intellectual growth of learners. This model only happen if the educator can create an open classroom environment and guide the ideas exchange.

According to Trianto (2009: 91), PBL is the interaction between stimulus and response, which is the relationship between the two directions of learning and the environment. The environment provides input for students in form of help and problems, while the brain's nervous system functions to interpret those help effectively, so the encountered problems can be investigated, assessed, analyzed, and sought for the solution. So, PBL is a problem-oriented model of learning that integrated with real life. In PBL, learners are expected to form a new knowledge or concept of the obtained information, so learners' ability to think are really trained. PBL aims to help learners to develop their thinking skills and solve problems, learn various roles of adult through their involvement in real experiences, and become autonomous or independent learners. This learning process helps learners to process a ready-made information inside their minds and develop their own knowledge about social world and its surroundings. This learning is suitable for developing basic and complex knowledge. Thus, this learning model was based on learning theory of information processing, i.e. cognitive learning theory.

This information processing activity was based on cognitive learning theory (Piaget) and oriented towards learners' ability to process information that can improve their ability. Information Processing refers to how to collect / receive stimuli from the environment, organize data, solve problems, discover concepts, and use verbal and visual symbols. Cognitive science is a study of human intelligence, computer programs, and abstract theory with an emphasis on intelligent behavior, such as calculation (Simon & Kaplan, 1989). The Information processing itself can simply mean a process that happens to learners to process information, monitor it, and strategize it based on the information with its core approach more to memory process and way of thinking. In the information processing theory, there are several teaching models that will motivate learners' knowledge development in term of controlling the stimulus of data collecting and organizing, problems realizing and solving, and concepts developing, so they are able to use verbal and nonverbal symbols on its delivery. Even the main orientation on the model leads to learners' ability to process and master an information, so it will corrects the obtained errors that associated with science.

According to Bruner, individual cognitive development can be enhanced through the preparation of subject material and present it in accordance to the stage of individual development. The main pressure of

cognitive psychology is its cognitive structure, which is the treasury of individual personal knowledge which includes long-term memory. (Suprijono, 2010: 22-24).

According to Suprijono (2010: 22), cognitive theory emphasizes learning as an internal process. Learning is an active mental process for achieving, remembering, and using knowledge. Lapono, et.al. (2008: 123) the mental structure of the individual develops according to the level of one's cognitive development. The higher the level of person's cognitive development, the higher the ability and skills in processing various information or knowledge received from the environment, both physical and social environment.

Based on the above explanation, it can be concluded that the theory of information processing learning (cognitive) is something complex which is strongly influenced by the invisible mental condition of learners, emphasizes learning as an internal process is always influenced by levels of development and understanding of themselves to processing various information or knowledge their received from the environment, both physical and social environment.

Thematic learning was packaged in a theme or can be called "thematic". Thematic learning is an integrated learning that uses themes as a unifying and binding material of several subjects in an integrated face-to-face meeting (Suyanto, 2013: 252). Thematic learning is an integrated learning that uses themes to link some subjects, so it can provide meaningful experiences for learners. Theme is a main idea or idea of a conversation subject. "Theme is a main idea or idea which become the speaker's subject" Depdiknas (2007: 226).

Thematic learning actively emphasize the involvement of learners in the learning process, so that learners can gain direct experiences and trained to be able to find their own knowledge. Through direct experiences, learners will understand a concept that they currently learn and relate them to other concepts that they have understood. This learning theory led by Gestalt Psychology figures, including Piaget who emphasized that learning should be meaningful and oriented to the needs and development of children.

Furthermore, thematic learning is also emphasizes more on applying the concept of learning while doing something (learning by doing). Therefore, educators need to pack or design a learning experience that affect the meaningfulness of learners' learning activities. Learning experiences that show the connection of conceptual elements make the learning process more effective. Conceptual link between the studied subjects will form a scheme, so that learners will gain the unity and roundness of knowledge. In addition, application of thematic learning in elementary school will greatly help learners, because according to the stage of development, learners still see everything as an intact (holistic).

Merging some basic competencies, indicators and subjects' content in thematic learning will become a saving because material overlap can be reduced and even eliminated. Learners are able to see meaningful relations because the content / learning materials has a role more as a tool, not as a final destination. Learning will become intact, so learners will get a sense about the process and learning materials as well. With subjects integration, the mastery of concept will be better and improved. Therefore, it needs a learning model that suitable with thematic teaching concept, one of them is PBL model. PBL is a learning model that begins with a problem solving, but to solve those problem, learners need new knowledge to be able to solve it.

PBL is one of the innovative learning models that can provide active learning conditions to learners. Problem-based learning is a learning model that involves learners to solve a problem through stages of scientific method, so learners can learn knowledge that related to the problem and also have skills to solve the problem. Therefore, a problem-based learning model is an effective way of learning with high-level thinking processes. Thus, problem-based learning can increase learners' HOTS in learning.

According to Sastrawati (2011: 6), HOTS is a process that involves mental operations such as classification, induction, deduction, and reasoning. While according to Rofiah, (2013: 17), HOTS is a thought process involving mental activity in an attempt to explore complex, reflective and creative experiences that are made consciously to achieve the goal of acquiring knowledge that includes the level of analytical, synthesis, and evaluative thinking".

Ministry of Education and Culture, Directorate General of Primary and Secondary Education (2014: 13), HOTS is the ability to recall information and assessments that more measure the capabilities that consist of transferring one concept to another concept, processing and applying information, looking for relations from different information, using information to solve problems, and review ideas and information critically.

Critical thinking ability is an organized process that allows learners to evaluate evidences, assumptions, logic and language that underlie the thinking of others. Creative thinking involves creating, discovering, imagining, guessing, designing alternatives, creating and producing things (Rofiah, 2013: 18). As a basis for knowing the domain of HOTS, it is adjusted with Bloom Krathwohl & Anderson's Taxonomy, 2001, that high-order thinking skill or HOTS involves the cognitive domain of Siagian (2012: 3) Bloom's revised cognitive domain (Anderson, et.al, 2001), i.e. knowledge (C1), understanding (C2), application (C3), analysis (C4), evaluation (C5), and creating (C6).

Meanwhile, according to Anderson and Krathwohl (Imam and Anggarini, 2008: 9) states that HOTS covers: (1) Analysis is a problem solving activity by separating each part of the problem and find the connection

between each part and find out how the connection can cause the problem. Analysis is a cognitive process which associated with attributing and organizing. (2) Evaluate is related to cognitive processes that provides an assessment based on the existing criteria and standards. Commonly used criteria are quality, effectivity, efficiency, and consistency. These criteria or standards may also be determined by the learners themselves. Evaluation consists of checking and critiquing, (3) Create is lead to the cognitive process that puts elements together to form a coherent unity and directs learners to produce a new product by organizing some elements into a different shape or pattern than ever before. Create consists of generating and producing. In this study, high-level thinking skills or HOTS in cognitive domain is present in C4-C6, i.e. analysis (C4), evaluation (C5) and creating or produce (C6). Based on the above description, then HOTS is a process of thinking and reasoning ability to solve a case or problem involving mental activity to achieving a goal of acquiring knowledge.

According to Dewi Salma Prawiladilaga (2007: 26), instructional design preparation, regardless of what model chosen, is a task of a team. The team consists of a designer, a teacher, a material expert, and an assessor. A creative educator must have several different learning designs in a learning course. Therefore, it is necessary follow-up the implementation of thematic learning at Elementary School 1 of Merak Batin, based on problems in this learning implementation, researcher needs to develop a model of learning with HOTS-based PBL learning which able to help learning activity work optimally, so researcher decided to conduct research on the development of learning model with the title: "Learning Development of Problem Based Learning Model Based on Higher Order Thinking Skill In Thematic Learning on 4th grader at Public Elementary School 1 of Merak Batin." This study aims to produce a product in form of problem based learning learning model based on higher order thinking skill in thematic learning on 4th grader at Public Elementary School 1 of Merak Batin.

II. Research Method

This research is a research development of learning model. The model developed in this research is HOTS-based PBL learning model. This research is an R&D development research with seven steps of Borg and Gall (1989). Total of research population is 60 learners and sampling technique used is cluster random samplings technique, so sample was taken with total of 44 learners which consist of 9 learners for small group limited trial, 15 learners for large group limited trial and 20 learners for field trial. The data collection techniques are in form of questionnaires and tests. Questionnaires were given to educators and learners to obtain data of needs analysis on the preliminary step. Then the questionnaires were given to the experts team and a limited group trial and field trial to evaluate the developed initial model.

The experimental design used in the field trial as well as the large group trial and small group trial is One-Group Pretest-Posttest Design, which consist of an experimental group without control group present. This design compares the pretest score (a test prior to using HOTS-based problem based learning learning model) to the posttest score (a test after using HOTS-based problem based learning learning model). The tests used are formative test in the form of multiple choice questions. The questions were used in this study to retrieve data from pretest and posttest.

III. Result And Discussion

The developed initial product was tested expertly by filling the questionnaires. Experts test were conducted by material expert, design expert and media expert. At this stage, a person who becomes a test validation expert should be educated at least Master degree in the field of education and have special skills. Percentage of expert validation assessment of the product component is 88% from design expert, 77% from material expert, 90% from media expert, so obtained an average of overall assessment by experts is 85%. The data are presented in the following bar chart:

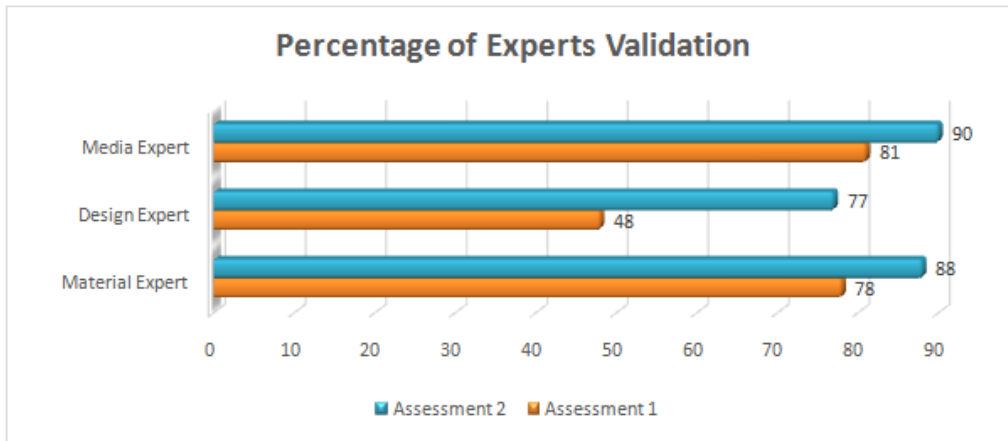


Figure 4.2 Bar Chart of Experts Validation Percentage

A limited trial was conducted on the small group and the large group to obtain and learn about their learning outcomes with HOTS-based PBL learning model. The small group trial was conducted with total research subjects of 9 individuals of 4th grader students. Meanwhile, the large group trial was conducted with total research subjects of 15 individuals of 4th grader students. The learning outcomes were seen from pretest and posttest scores, which are scores before and after using HOTS-based PBL learning model. Furthermore, this group trials were conducted to see the suitability and easiness of HOTS-based PBL learning model to improve learning outcomes of 4th grader students after following the learning. The average scores of pretest and posttest outcome in the small group limited trial was 63 and 92 respectively. While the average scores of pretest and posttest outcome in the large group limited trial was 63 and 92 respectively. Those scores were presented in the following bar chart below:



Figure 4.3 Bar Chart of Limited Trial Average Scores

Field trial was conducted on a large number of classes to acquire and learn about students' learning outcomes with HOTS-based PBL learning model. Field test was conducted with total of 20 individuals of 4th grader students as the study subject. The learning outcomes was seen from pretest and posttest score, namely scores before and after using HOTS-based PBL learning model. Furthermore, this group test was conducted to see the suitability and easiness of HOTS-based PBL learning model to improve 4th grader students' learning outcomes after following the learning process. The learning scores of pretest and posttest in field trial was obtained that the average pretest score is 65 and average posttest score is 94. The scores are presented in the following bar chart below:

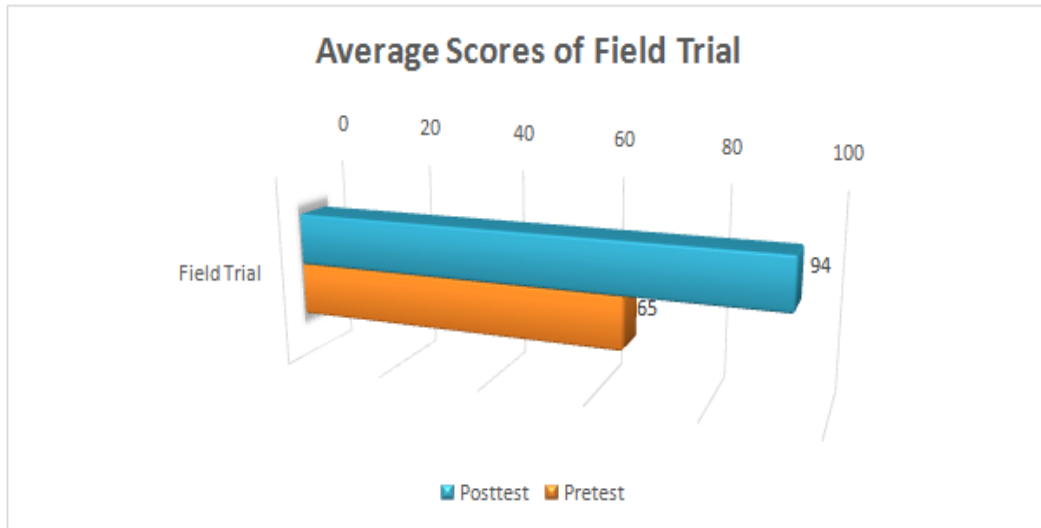


Figure 4.4 Bar Chart of Field Trial Average Scores

The product effectivity test was performed using normalized N-Gain which compares learners' learning outcomes before and after using HOTS-based PBL learning model. Learning can be said as effective if (N-Gain) $\geq 0,70$. N-Gain is obtained from pretest and posttest scores (data attached) in the limited trial of the small group, the large group and field trial. The score was calculated to obtain the data of N-Gain score, the small group trial score was effective because $0,80 \geq 0,70$. N-Gain on the large group trial was effective because $0,83 \geq 0,70$. N-Gain on the field trial was effective because $0,84 \geq 0,70$. Thus, it can be concluded based on the calculation, the average of normalized N-Gain score is 0.82 and classified as high, so the use of HOTS-based PBL learning model on thematic learning of 4th grader at Public Elementary School 1 of Merak Batin was proved to be effective.

Efficiency measurement using HOTS-based PBL learning model on the 4th grader thematic learning at Public Elementary School 1 of Merak Batin was conducted by comparing the time needed based on the learning plan (the provided time) and the time spent on learning in general. From the test result, it was obtained that the provided time is 150 minutes in 1 lesson. Time spent in this study is 145 minutes in 1 lesson.

Efficiency = $\frac{\text{Time needed}}{\text{Time spent}} = \frac{150 \text{ minutes}}{145 \text{ minutes}} = 1,03$ (high)

Time spent 145 minutes

Based on the result of the above time calculation, it was obtained a ratio score of 1.03 which is classified as high, so it can be concluded the use of HOTS-based PBL learning model on the 4th grader thematic learning at Public Elementary School 1 of Merak Batin was proved to be efficient because $1,03 > 1$.

The attractiveness of using HOTS-based PBL model in the 4th grader thematic learning at Public Elementary School 1 of Merak Batin was obtained by filling the questionnaires, data that obtained from learners and 4th grader teachers.

No.	Samples	Percentage	Attractiveness Classification	Level of Classification
1.	Small Group Trial	80%	Attractive	Easy
2.	Large Group Trial	83%	Attractive	Easy
3.	Field Trial	86%	Attractive	Easy
Average		83%	Attractive	Easy

Based on the above table, it can be concluded that the use of HOTS-based PBL learning model on 4th grader thematic learning at Public Elementary School 1 of Merak Batin was proved to have an attractiveness, because it was obtained a percentage of 83% which is classified as attractive.

Hypothesis test using Pretest and Posttest One Group Design with the following statistical formula of t-test (Arikunto, 2010: 349):

$$t = \frac{Md}{\sqrt{\frac{\sum x^2 d}{N(N-1)}}} \text{ with } Md = \frac{\sum d}{N}$$

$$Md = \frac{\sum d}{N} = \frac{570}{20} = 28,5$$

$$\sum x^2 d = 255.00$$

$$\begin{aligned}
 t &= \frac{Md}{\sqrt{\frac{\sum x^2 d}{N(N-1)}}} \\
 &= \frac{28,5}{\sqrt{\frac{255,00}{20(20-1)}}} \\
 &= \frac{28,5}{\sqrt{\frac{255,00}{380}}} = \frac{28,5}{\sqrt{0,6710526316}} = \frac{28,5}{0,8191780219} = 34,79
 \end{aligned}$$

$t = 34,79$ (after consulted with table $t_{0,05}$ on Arikunto, 2010: 402) $d.b = N - 1 = 22 - 1 = 19$. With $t_{0,05}$ value = 2,09. So, $34,79 > 2,09$ or $t_{hit} > t_{tabel}$.

The difference between pretest and posttest score was significant. The result of hypothesis test is the development of HOTS-based PBL learning model in 4th grader thematic learning at Public Elementary School 1 of Merak Batin, is an effective, efficient and interesting product in supporting the learning process, so learners can achieve the goal competencies that have been set before.

IV. Conclusion

The use of HOTS-based PBL learning model in 4th grader thematic learning at Public Elementary School 1 of Merak Batin was proved to be effective with high qualification, based on the average calculation result of N-Gain score of $0,82 \geq 0,70$. Efficiency with learning time calculation was obtained a ratio score of 1.03 with high classification, as $1,03 > 1$ (efficient). The attractiveness obtained a percentage of 83% which is classified as attractive. The hypothesis test was proved that there is influence on the use of HOTS-based PBL learning model in 4th grader thematic learning at Public Elementary School 1 of Merak Batin. It obtained score of 34,79 with $t_{0,05}$ t value = 2,09. So, $34,79 > 2,09$ or $t_{count} > t_{table}$. The difference between pretest and posttest results was significant.

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