

THE DEVELOPMENT OF WORKSHEET BASED ON PROBLEM BASED LEARNING – THINKING MAPS STRATEGY TO INCREASE THE CRITICAL THINKING OF PRIMARY STUDENTS

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ABSTRACT--- *The goal of this experiment and development is to enhance worksheet which is on the basic of problem based learning with the strategy of thinking maps in proper way and increase the skill of critical thinking effectively. This method of observation uses the Borg and Gall's design. The populations of this experiment are the fifth grades students from Lampung Tengah Primary School in Lampung Province, Indonesia worksheet product validated media expert, theory expert and practitioner. Data collector uses a valid and reliable objective test instrument. Data analysis operates N-Gain. The research result showed that worksheet is valid and decent to be used and it's very convincing to expanse students critical mind skill.*

Key words-- *development of worksheet based on problem based learning – thinking maps strategy to increase the critical thinking of primary students*

I. INTRODUCTION

The development of knowledge technology and art in the Millennium era and industry revolution 4.0 in education. Hopefully the students would master the literacy, thinking in a high level, big data and another intelligence. The role of education rises strategically and it's important to obtain graduated students who have conversances and skills and ready to follow the world development.

Bialik (2015: 1) the skills that each student must has in 21st century is creativity, critical thinking, communication and collaboration (4C's) supported by acceleration potentiality the supply of big data and be able to make any decision independently, kindly and responsibly. Susanto (2014: 109) Creative Thinking is the way of thinking in various alternatives, creating new inventions and innovating for learning result that must be achieved. Critical Thinking is being active and ingenious to conceptualize, apply, analyze, synthesize or evaluate information that was already obtained the ability to communicate is how we express ourselves by the information that we got to attain the aim. Leicester and Taylor

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(2010: 2) critical thinking can be thought as a toolbox of skills which enable children to think more deeply and clearly about what they believe and what they read or are told in the media, about what they should do.

Critical Thinking as a skill to think deeper and clearly about what we believe through reading, media and other sources so we believe about the truth of concept can be applied to finish the problem (Stobough, 2012: 2) critical thinking is deeply processing knowledge to identify connections across disciplines and find potential creative solutions to problems. Critical thinking is needed by students in learning. Judge, et al (2009: 4) some of the most important skills you will need to learn as an education student are the ability to think both critically and objectively about an issue and present a well – constructed argument. Stobough (2012: 4) embedding critical thinking skills in the curriculum helps sustain an educated citizenry: prepares students for college, future careers, and life situations. The skill to have critical thoughts for students to ask, bring up opinions, and resent the information which they obtain. Bassham, et al (2007: 58) critical thinking is the general term given to a wide range of cognitive skills and intellectual dispositions needed to effectively identify. Analyze and evaluate arguments and truth claims, to discover and overcome personal prejudices and biases, to formulate decisions.

Tsai Chen, Chang and Chang (Siew and Mapeala, 2016) critical thinking is the key of cognitive skill, disposition, and science education. Vale (Siew and Mapeala, 2016). Skilled students to think critically are considered to understand scientific process and become more experimental and better in submitting question in different aspect from knowledge ability to formulate question is very important for students' knowledge because it's the basic of learning individually and investigating. Costa (Komalasari, 2010: 266) the critical thinking consist of (1) deciding the law of consequences, (2) giving the meaning of new discoveries, (3) detecting regularity in between phenomena, (4) quality determination with clarification, and (5) critical thinking is a progress that intends to decide logically and rationally. That intends to decide logically and rationally. Johnson (2006: 210) thinking critically is a systematic mental activity. Rajendran (2013: 20) critical thinking is the intellectually disciplined process of activity and skillfully conceptualizing, applying, analyzing.

Spliter (Komalarasi, 2010: 266) the skill to think critically is a skill to speculate and reflective thinking that focusing to determine things which are believed and done, synthesizing and evaluating information. Ennis (Susanto, 2013: 125) skill indicator of critical thinking are divided into five categories, there are: (1) elementary clarification, (2) basic support, (3) interfering, (4) advanced clarification, and (5) strategies and tactics. Saputro, et al (2013: 37) as followed (1) the skill to analyze is a capability to elucidate a structure into more detailed components, (2) the skill to synthetic is a capability to connect pieces into a new shape, (3) the skill to know and problem solving is a capability to applicative concept to some new understandings, (4) the skill to conclude human thoughts activities based on definition and erudition (the truth) which owned to reach the new and different definition and erudition (the truth), and (5) the skill to evaluate is establishing the value of a thing with various criteria that are available by using certain standard.

Performance of learning in one education shall be addressed to develop student potential through interactive, inspiration, pleasure, challenging, motivating every student to be active in participating as their talents, interest, physical development and student psychology. Meyers (Siew and Mapeala, 2016) the learning environment was made conducive to develop critical thinking that has 4 factors, (1) Stimulating the interest of participant (2) Creating a meaningful discussion (3) Acknowledge the thoughts and the views of others (4) Encourage the atmosphere of mutual trust and support each other well. National Council of Teacher of Mathematics (NTCM), Mason, Burton and Stacey, Innabi and

Sheikh (Firdaus, et al, 2015) The effort in developing Mathematics Critical Thinking has become the first journal of Mathematics education curriculum in the whole world.

NTCM Perak and Kenney, Semerci, Jacob, Chukwuyenum (Firdaus, et al, 2015) the skill development of critical thinking can increase the Mathematics achievement. The skill of critical thinking will push student to think independently and solving problems at school or in the daily life context. In the Mathematics problem solving context, Krulik and Rudnick (Firdaus, et al, 2015) stated that critical thinking is analytical and reflection that involves activity testing, questioning, connecting and evaluating every aspect of a situation or problem.

Cobb, et al (Firdaus, et al, 2015) the ability of critical thinking is significant in learning Mathematics because this ability can intensify the quality of Mathematics learning and be meaningful. Cochrane (Siew and Mapeala, 2017) PBL is to increase the community of learners which supports the occurrence of students and educators. N. Drake and Long (Mapeala and Siew, 2016) the model of PBL can form the skill of mastering information in a longer period of time for the students. Chakravarthi (Jatmiko, et all, 2018) The model of PBL empowers the environment as the sources and the structure of learning. Bern and Erickson (Komalasari, 2015: 59) Emphasize that the problem based learning is a learning strategic that involves students in problem solving which integrates various of concepts and skills from discipline skills. Anita (Yamin, 2013: 64) who also stated that the goal of problem based learning is to increase the motivation of intrinsic and skill in problem solving, collaboration and studying through the ages, self-directed. The steps of PBL's learning according to Arends (Wisudawati and Sulistyowati, 2014: 91) as following : 1) orienting students to the problem, 2) organizing students for studying, 3) assisting independent and group investigation, 4) developing and presenting article and exhibits, 5) analyzing and evaluating the problem solving process. The educator's role in PBL's implementation with the Thinking Maps as the strategy hoped to control learning activities and push active students to take a role and show the multilateral interaction between the educators and their students. David Hyerle (1996: 1) thinking maps are eight fundamental thinking skills, defined and animated by maps and introduced as a common visual language for thinking and learning communities. Alikhan (2014: 3) thinking maps are visual representations of thinking that help students see their own learning pathways or the thought of processes utilized to solve a problem. Hyerley and Yeager (Siew and Mapeala, 2016) thinking maps helps students to control their selves in studying and make them to be more success. Thinking maps has eight basic thinking skills which are described by maps and introduced as general visual language for thinking and learning communities. According to Holzman (2004: 1) thinking maps is an important strategy to help students reach the goal of learning in a good way, the style of students learning is kinetic, auditory or even verbal. According to Alikhan (2014: 3) thinking maps are a set of eight maps based on cognitive skills that support the brain's natural tendency to detect pattern of an information. While according to Chris Yeagar (Hyerle, 2014: 19) thinking maps as tools to support processing, sharing, understanding, refining, presenting and questioning information in order to transform information into knowledge. Thinking Maps function is as device for thinking mediation, listening, speaking, writing, problem solving and getting new knowledge.

Alikhan (2014: 11) thinking maps support the brain's natural pattern-seeking tendencies and create dynamic visual representations of the eight fundamental thinking skills. Thinking Maps drive the learning process, improve student performance, allow teachers to monitor and gauge student progress and make information and learning more meaningful. Thinking Maps support someone to shape a more dynamic thought, increase the performance, make the information to

be more meaningful. Winfield (Alikhan, 2013: 3) these maps often help promote reading comprehension, the writing process, problem solving and thinking skills. Price (2015: 4) thinking maps are critical thinking tool that is most effectively used when students have the ownership of choosing the Thinking Map(s) that best represent their cognitive choice. Othman, Ismail, Jaafar and Samsudin (Siew and Mapeala, 2016) Thinking Maps increases the skills : (1) describing the concept, (2) making a group and organizing information, (3) organization, (4) comparing the different, (5) identifying the cause and effect, and (6) analyzing and decision making.

Toman (2013: 174) worksheets are one of the teaching methods which can be done individually or in group work and enable conceptual development. Choo (2011: 519) worksheet is an instructional tool that consisted series of questions and information which designed to understand the complex ideas, guide the students to do systematic activities. Lee (2014: 96) as an assessment tool, worksheets can be used by teachers to understand students' previous knowledge, outcome of learning and the process of learning, at the same time, they can also be used to enable students to monitor the progress of their own learning. Yildirim (2011: 45) who explained that worksheets are known to help students gain scientific process skills such as setting up experimental mechanism, recording data, interpreting the data and soon so that they can be conceptualize the concepts in their minds.

Mainly, the learning that takes place at school use the lecture method and slight assignment based on memorizing the facts that lead the students to think less effectively. Because of that, causing the students to think less optimally and the skill of thinking in learning is also inconsiderable. This thing is indicated the students' thinking skill in Indonesia has the lowest level, the observation result of TIMSS in 2015, 4th grade students showed up at the 44th rank out of 56 countries with the average scores were 397. Meanwhile, the average scores in another countries were 500 so the average scores of Indonesian' students was on Country Average Significantly Lower (IEA, 2015: 19-20). Whereas PISA's result in 2015 showed Indonesia was in 69th rank out of 76 countries (OECD's survey, 2016: 6) to 236 schools in Indonesia bring out that in Mathematics competition was increasing from 375 points in 2012 to 386 points in 2015. That date showed that the Mathematics' skill of Indonesian students has gained a little, even though it still at the lowest average score in International levels.

Showing the learning subjects which are used when the researchers did the observation, the source of the exercise tasks were from students' books and also worksheet. Worksheet that used by the students hasn't led the students to get the experiences directly yet, so the students can't develop their critical thinking skill since worksheet that they have been using is from it's creator and wasn't made by the teachers, it means that the worksheet doesn't suit the students' necessary.

Analytics' requirement result used the questioner from teachers' requisite that 100% agrees to develop the worksheet based on PBL with Thinking Maps as the strategy, such as on this table. The low of studying quality are caused by a few factors, one of them is the fact that there are some un-professional teachers (planning, executing and scoring) in learning. The quality of learning is needed to be improved, supported by a set of studying (worksheet, learning books, media, device and other supporter devices). Based on analytics' requirement result that obtained from questioner spreading, 100% of educators never applied PBL along with Thinking Maps' strategy as their way of learning.

That analytics' requirement result, supported by students' formative grades, Ki Hajar Dewantara group Central of Lampung regency, Indonesia with the studying completeness 31,78%. It means that the students' thinking skill is very low. Depend on the view above, the observation and development became urgent to be done with the title "The
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development of students' worksheets based on PBL with thinking maps strategy to increase the skill of Critical Thinking of 5th grade of primary school in Mathematics subject".

The goal of this experimental afford worksheet based on PBL with Thinking Maps strategy is worthy to boost Critical Thinking; and describe worksheet based on PBL effectivity to the Critical Thinking of the students in Mathematics. This research is important to facilitate the students with worksheet based on PBL with the Thinking Maps strategy to make them be more optimal in Critical Thinking ; motivating the educators to be creative in teaching so the students would be interested enough to follow the studying method ; increase the information about the device / media / learning source of worksheet and become an alternative way of studying to be more interesting, easy, effective and efficient in Mathematics learnings.

II. RESEARCH METHOD

This research and development has a goal to produce a product of worksheet which applied in Mathematics learning of 5th grade students. The stages used to reference the new model of Borg and Gall's design (1983: 781). In the first stage to seventh stage (doing the revision of the first product after being tested). This thing is limited by 7 stages because the 8th stage and next must be done in a high scale, dissemination of the product must be done after the quality control before being published that needs a longer time while this progress has a deadline.

Experiment procedure and development in seven stages based on Borg and Gall's design can be explained as these : (1) Early information gathering, that is analysis sources reference / literature review, observation / class observation and problem identification using questioner which is compatible with educator and students' necessary, that can be seen during the learning and choosing the perfect alternative of solving solution from school; (2) Planning embody identification and first condition definition, determine the goal, sorting and a little experiment in a small scale, analyzing the curriculum to determine the basic competition planning, learning indicator, learning goals, subjects coverage, and sorting the instrument guideline; (3) The first product's development comprises: The preparation of learning lessons, arranging the handbooks and evaluation sets. Expanding the first shape in the draft form of worksheet's product. Worksheet based on PBL with Thinking Maps strategy is the result of this development and observation; (4) the experiment was done to test the instrument's validity and reliability of the 5th grade students and validate worksheet through the subject master with the aim of theory and media lecturer, practitioner and the user of first field test result;, (5) first product revision is a revision of the first product, rely on the suggestion of the validator (two masters), practitioner (one teacher) and used (six students) in the first experimental; (6) first product research will be done before and after learning process; and (7) first product revision to a first product as a first product observation, suggestion, and inputs will be given related to the product which is being developed.

Data's collector uses test instrument (double options) to get an effective user data of worksheet rely on PBL with Thinking Maps strategy and measure the students' Critical Thinking skills in the forms of pre-test and post-test, with the indicators (1) analysis, (2) evaluation, (3) interpretation, and (4) resume, with one score for the correct answer and zero for the false answer. Development instrument that is done in validation way using the formula of Product Moment and the reliability use Alfa Cronbach. Test instrument of Critical Thinking skill involve two subjects, Elementary Math with basic competence "Explaining the comparison between two big differences (speed as the ratio of distance and time, debit

as the ratio of volume and time) and problem solving relevant with the comparison of two big differences (speed, debit)“. Effectivity is determined by N-Gain.

Instrument pages' observation is used to collect data related to worksheet's validity based on PBL with thinking maps strategy referred to theory expert and media expert. Instrument guideline to validate worksheet's media and instrument test are (1) the compatibility between worksheet and pedagogical requirement, (2) The compatibility of LKDP and construction requirement, (3) The compatibility of worksheet and technic requirement. Subjects' validation of worksheet compatibility based on PBL with Thinking maps strategy with (1) questioning, understanding, progressing, sharing and presenting stage, (2) worksheet's quality.

III. THE RESULT OF RESEARCH AND DISCUSSION

The goal of this observation and development is to produce worksheet based on PBL and a worthy Thinking Maps and, describing the effectivity of worksheet based on Thinking Maps strategy, increasing the students' Critical Thinking Skill in learning Mathematic for 5th grade students.

1.1. The development of worksheet based on PBL,

Thinking Maps strategy are supported by 7 (seven) stages, as the following:

1.1.1. Collecting the early information

The first research that need to be done is to identify Mathematics learning, analyzing document of students' learning result which created as basic consideration of worksheet development. This empirical data was contrived as the profile and subject's development. The questioner's result of students and teachers' needs, supported by the observation's result in Learning Mathematics, was obtained by the first data, such as: (a) most of the teachers use lecturer method or teacher centered, presenting the subject only for students' books. They don't involve the students to do subjects construction, (b) one way learning, it makes the students be passive and not active when they are learning in the class, (c) the Mathematics studying result is only 68,22%, not even completed enough (Below standard; (d) worksheet which is used by the students was created by the creator, the lessons aren't suitable with the students' needs; (e) Worksheet isn't very optimal yet to be used to increase the students' critical thinking skill; (f) Worksheet contains task or exercises, not referring to form a critical thinking skill. The analyzing of that needs showed that the development of worksheet is needed to solve the problem of students that involved actively, an interesting and fun learning but meaningful at the same time. Worksheet which is expanded worksheet based on PBL-Thinking Maps that capable to increase the critical thinking skill of the students.

1.1.1.1. Planning

The growth of worksheet based on PBL-Thinking Maps strategy can be done with these steps: (a) Curriculum analyzing for Mathematics subject learning development, explaining two big comparisons (Speed, debit). (b) The structure of worksheet development can be done by sorting the frameworks, systematic that compatibles for PBL, and that is problems orientation, organizing the learners, leading the individually and group's investigation, developing and

servicing the masterpieces and analyzing and also evaluating problem solving progress. This PBL syntax are combined with three Thinking Maps learning strategies, they are: The Circle Map, The Bubble Map, and the Double Bubble Map. (c) Plan an evaluation tool to assess product effectiveness.

II.I.III. LKDP Development

will be done with stage (a) Pre-written is done with the research along with the related references, (b) Draft sorting that pointed to PBL syntax and Thinking Maps strategy.

II.I.IV. The experiment of the first product

the worksheet validity is going to take a part in this observation by theory expert and media / design. The result of subject validity as below.

Table 1: The score table of theory expert validation

Number	Aspect Score	Score	Max Score
1	The suitability of worksheet to Thinking Maps strategy	32	35
2	Worksheet quality	40	45
Score Total		72	80
Score		90	

Sources: Theory expert validation’s result
Media / Design validation by media / design expert’s result, as below.

Table 2: The score table of media / design expert validation

Number	Aspect Score	Score	Max Score
1	Didactic Requirement	40	45
2	Construction Requirement	20	25
3	Technic Requirement	45	50
Score total		105	120
Score		87,50	

II.I.V. First product revision

done by validation expert’s advices, a small group experimental, next stage is to fix and improve the perfection of worksheet which is being developed.

II.I.VI. Product experimental

worksheet based on PBL, Thinking Maps strategy to a big group with the experimental subject with 41 students. The experimental result of a big group, achieved as following

Table 3: The summary of students’ studying result in a big group

Studying result	Pre-test	Post-test
Total	1802	2597
Average	53,00	76,38

N – gain’s entirety	0.50
Category	Moderate

Source: Counting result

The studying result of a students’ group showed that there was an increase in learning before and after it, using worksheet based on PBL with Thinking Maps strategy and students’ critical thinking increased.

II.I.VII. Worksheet last product

Worksheet last product was achieved after the experiment of product in a big group and inventions when the experiment was being tested. Worksheet experiment in a big group showed us that the students’ learning was increased. Based on theory expert validation, media expert, suggestions practitioner and the students’ learning effect became worksheet based on PBL with Thinking Maps strategy is worthy to be implemented in studying.

II.I.VIII. The effectivity of worksheet based on PBL-Thinking Maps

Worksheet based on PBL-Thinking maps strategy’s product was seen from the increasing of students’ thinking skill. Students’ post-test result, as here:

Table 4: Frequency Distribution of Class Experiment Post-test

Number	Class	Frequency
1	59 - 65	3
2	66 – 72	10
3	73 - 79	10
4	80 - 86	11
5	87 - 93	7
6	94 - 100	0
Total		41

The result of Post-test (Raw data) showed that all the students are 100% fully completing the KKM which the maximum score is 60. Meanwhile, the increasing of critical thinking was obtained as following:

Table 5: The Studying Result with the Based of Critical Thinking

Number	Frequency	Percentage	Category
1	229	79,79%	Very excellent
2	218	75,76%	Very excellent
3	233	71,04%	Good
4	250	76,22%	Very excellent
Average	232,5	75,75%	Very excellent

The students whom being experimented were 41 students, while the tasks were about 30 items with 7 tasks of detail indicator, evaluating 7 tasks, interpretation of 8 tasks and concluding 8 tasks, so the total score were 1230. Interpretation indicator in the good category when the other indicators were very excellent which showed us that, it needs an attention from the daily data interpretation or object’s observation, preparing the data and interpreting the analysis and evaluation results.

The effectivity of worksheet with PBL-Thinking Maps, analyzed from the increasing of study result from pre-test to post-test. The counting results used N-Gain, showing that the N-Gain was about 0.50 (Moderate category). Based on that counting then worksheet based on PBL-Thinking Maps' hypothesis is effective to increase the critical thinking of students.

IV. DISCUSSION

II.III.I. Worksheet with PBL basis-Thinking Maps development

This development of Mathematic subject, speed and debit, adapted seven stages from ten stages R & D, Borg & Call (1983: 781). This worksheet's development was started by collecting the first information, followed by planning, worksheet's product development, first product observation, first product revision, product experiment and product revision. The analysis results of this early development (observation, interview and questioner) stated that most of learning pattern still uses teacher center and approaches, the Mathematics' learning result was low and students critical thinking isn't optimal yet.

Worksheet with PBL-Thinking Maps as a solution to solve the problem above and can increase the skill of students' critical thinking. Firdaus. et all (2017) found that there's a positive effect from using the module of Mathematics' learning based on PBL to increase the students' critical thinking, that is to identifying and interpreting information, analyzing information and evaluating the evidence and argument.

When answering the questions, students aren't capable yet to see the mistakes from the questions which were done, and it's too difficult to answer the questions that similar to examples. This thing indicated to the learning that doesn't facilitate the students to analyze the exercises. Omar & Al Bakri (2016) showed that Thinking Maps can help educators to grow the students' critical thinking, so the unity of PBL model with Thinking Maps strategy can increase the students' critical thinking. Siew and Mapeala (2016) showed that PBL combined with the Thinking Maps is more effective in increasing the critical thinking of learners.

Worksheet's product based on PBL-Thinking Maps strategy which developed has completed the studying concept and learning. Rely on the theory of studying constructivism's base, learning is a result of students' construction as the interaction with the environment. This thing suits Susanto's opinion (2014: 96) that learning according to the constructivism's theory is that the students their selves must find and transformed the complex information, checking the new information with old rules, and revisited them if the rules are no longer used. Because of that worksheet with PBL-Thinking Maps' development was designed so that the students can observe, experience by themselves and get information which is available in worksheet's text, picture, illustration or activity steps, so it can push students to construct the knowledge with their own experiences.

The planning of worksheet based on PBL=Thinking Maps, was began to make some plans of learning and sorting worksheet drafts. The next step is to do the experiment of first product, the validity test will be done by two validators or one colleague as the practitioner, fitting the development requirement so it can be tested well. The validation's results (1) Theory expert validation, pervading the worksheet appropriate which is developed by the content's quality and worksheet's with PBL model corresponding – Thinking Maps, must fix the product involved the cover, so can draw a subject with the model and strategy of learning that been developing, the user guide of worksheet for teachers and

learners, activities and questions that motivates the students to think critically. (2) The validation of media expert, covering the making of worksheet's requirements, there are didactic stipulations, construction and technic. The media expert gives and advice to repair the product by publishing the pictures source that are used. (3) The validation of colleague, suffusing the worksheet's suitable that is developed with the content's quality, PBL's model-Thinking Maps, the making of worksheet are didactic requirement, construction and technic. The advice of colleague in fixing the product to the activity and time allocate which is specified, the interesting display and content and be able to increase the students to think critically. After the validation's test, the next step is to do a product's revision based on the suggestions and comments from each the validators and practitioners, next the small group's experiment will be done. The next step is to do a big group's experiment and the pre-test is the first thing to do to find out the skill of students' through the experiment before using the worksheet with PBL-Thinking Maps, then the second thing to do is doing the pre-test. The pre-test and post-test showed that the students' learning increased, so there's a conclusion that the product which is developed is effective in increasing the skill of students' critical thinking. The last stage is the researchers do a revision to make the product perfect.

The using of worksheet based on PBL-Thinking Maps strategy in learning began with stimulus through the activity in observing a picture to increase the speed and debit. This learning uses conceptual approaching's principle to associate speed subject and factual. Active learning is good method to do by students because this method gives the chances for students and involve the students to always study (Learning by doing). In the last learning, there will be a valuation of the learning's results to figure out the effectivity of using worksheet based on PBL-Thinking Maps strategy. Lee (2014: 95) stated that the activity sheets can benefit many things including academic's accomplishments as the source of studying supplement and getting to know more knowledge. Five stages of PBL and three Thinking Maps strategies are applied in worksheet and there are, orientating the problem, organizing, guiding, individualism or group's investigation, developing and presenting the masterpieces, analyzing and evaluating problem solving's progress (Arends in Wisudawati and Sulistyowati, 2014: 91). Those five stages of PBL are combined to three strategies out of eight strategies of Thinking Maps and they are the circle map, the bubble map and the double bubble map (Hyerele, 2004: 6). The circle enable the students to produce the relevant information about a topic, the bubble map which is used to identify the characteristics, and the double bubble map which is used to compare and differentiate two things.

II.II.II. The effectivity of Worksheet with PBL basis with the strategy of Thinking Maps

The effectivity of worksheet with PBL-Thinking Maps strategy which is developed to increase the studying and critical thinking of students. Thinking critically are valued by 4 (four) indicators, those are: The skill to analyze, evaluate, interpreted, and conclude. The increasing of learning from pre – test to pro – test by N-Gain 0,50 (Moderate category). Siew and Mapeala (2016: 602) showed that the using of PBL model-Thinking Maps strategy can increase the students' critical thinking. Toman (2013: 178) worksheet which is developed and closed to constructivism, increasing the students to participate actively to follow the learning (Actively participate during the learning process), help the students to understand the subject better (To learn the subject better) and increase the students' skill (Increase students success noticeably). Because of that, worksheet with PBL basis-Thinking Maps strategy is recommended to be apply in learning process at school.

V. SUMMARY

The analysis's result from worksheet's data experiment and development based on PBL-Thinking Maps strategy, showed that this product is valid and worthy to be used by primary students in Mathematics learning and it's effective enough to increase the critical thinking of learners.

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