*IOSR Journal of Research & Method in Education (IOSR-JRME)*
*e-ISSN: 2320–7388,p-ISSN: 2320–737X Volume 8, Issue 1 Ver. IV (Jan. – Feb. 2018), PP 65-72*
*www.iosrjournals.org*

# Development of Problem Based Learning Model Learner Worksheet To Improve Critical Thinking Ability

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**Abstract:** Development of Problem Based Learning Model Learner Worksheet to Improve Critical Thinking Ability The problem of this research were the students achievement had under score of standard criteria and learner worksheet is not available that meets the needs. The aim of this research was to produce and test the effectiveness of development PBL model learner worksheet to improve critical thinking ability of students in fourth grade of elementary school. The method used is research and development (R&D) which refers to Borg&Gall's theory. The population in this research is all of students in fourth grade at Kedamaian subdistrict. The sample used is 70 students with random sampling technique. The collection of data through questionaire and written test. The data were analyzed by using N-Gain formula. The results show that PBL model learner worksheet is feasible to use and PBL model learner worksheet is effective to improve critical thinking ability of students.

**Keywords**: learner worksheet, PBL, critical thinking ability

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Date of Submission: 16-02-2018 Date of acceptance: 03-03-2016

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## I. Introduction

Education is a necessity in human life that providing a provision to live life and to prepare for a better life in the future. Then, to make that happen, education should prepares a good provision to process humans' mind through a learning process.

The Indonesian curriculum has objectives for preparing Indonesian people to have the ability to live as individuals and citizens who are faithful, productive, creative, innovative and affective, as well as able to contribute to the life of society, nation, state, and world civilization. Indonesian curriculum was no longer develops all subjects as a discipline, but as an integrative science that emphasizes the development of learners' various abilities, one of them is the problem solving ability. Based on the learning objectives in this Indonesian Curriculum, Researcher conducted a preliminary research in 4th grader students of a public elementary school. Researcher obtained a result that despite the presence of curriculum and teaching materials such as books and Learner Activity Sheets / Learner Worksheets (Indonesian: *Lembar Kegiatan Peserta Didik*/ LKPD), but in practice, the learning activity is still centered on teacher-based learning, less involving learners, the used learning sources are still minimal, and the used books and learner worksheets are not maximized and not suitable to what they needed.

The learner worksheets that used in school tends to be less supportive with the material bills of the curriculum, and tends to only contain the completion of conceptual materials. This means that learners are not given the opportunity to use and apply the learning concepts in everyday life. Thus, the presence of learner worksheets which originally be a medium of learner competencies improvements are not resulting a visible values and learner worksheet was only seen as a formality medium of score-adding assignments for learner.

According to Trianto (2011: 222) learner worksheet is an activity sheets which containing a set of basic activities that must be done by learners to maximize learning comprehension, in an effort to establish basic capabilities according to the pursued achievement indicators. According to Suyanto (2009: 1), learner worksheet is a teaching material that packed in such a way, so learners can learn the material independently. The definition of learner worksheet stated by Widjajanti (2009: 89), learner worksheet is a worksheet that contains information and instruction from teacher to learners to working on a learning activity in the form of works, practices, or applying the learning outcomes to achieve a goal.

Learning activities will be more optimal if the use of learner worksheets were associated with appropriate learning models and needed targets. Because if learner worksheets only used passively in the learning process, learners' learning outcomes and critical thinking skills will not be maximized.

This can also be seen from the participation of learners in the thematic learning process which is still relatively low, it can be seen from the learning outcomes of 4th grader students at Public Elementary School 1 of Kalibalau Kencana which is still relatively low. It was shown that there are 74 learners (70.4%) of the 105 learners who obtained learning results below the minimum passing score. While the results of needs analysis questionnaire filled by teachers showed that 67% of teachers have not used *Problem Based Learning* (PBL) model of learner worksheets. Furthermore, it also seen that learners are limited to using the learner worksheets. Learners are only instructed to directly answers the question exercises from the textbook, done alternately with the question exercises from the learner worksheets. To solve the above conditions, it is necessary to develop a Learner Activity Sheets with a learning model that can support the learning process by directly involve the learners to solve problems and improve their critical thinking ability. According to Ward in Ngalimun (2012: 89), PBL model is a learning model that involving the learners to solve a problem through the scientific method steps, so learners can learn knowledges that related to the problems and also have an ability to solve that problem. PBL also supports students' thinking skills to a higher level, especially their critical thinking skills. The concept of PBL model is actually supported by the Experiential Learning theory, where learners are learn to think strategically with problem solving (Hmelo-Silver, 2004).

According to Bern and Erickson in Komalasari (2015: 59), Problem Based Learning is a learning strategy that involve learners to solving problems by integrating various concepts and skills from different disciplines. While according to Atez in Saleem (2014: 128) PBL is a student-centered teaching approach that allow learners to become active in problems solving, answering questions, work together on learning, work in team on issues or projects, and take more responsibilities for learning.

The goal of PBL is to apply the skill of critical thinking, problem-solving, and content knowledge to solving real-world problems and issues (Levin, in Kartal, 2014: 111). Anita in Yamin (2013: 64) also stated that the purpose of problem-based learning is to increase intrinsic motivations and skills in a problem solving, a collaboration, and a self-directed lifelong learning. The steps of PBL according to Boud and Feletti (1997: 20) that incorporated into the process of developing learner worksheets are starting from formulating the problems, formulating the hypothesis, collecting data, analyzing the problems, and concluding. Those five steps are also suitable to the indicators of critical thinking.

Referring to the implementation of the learning process in the Indonesian Curriculum, it was hoped that the learning process will be student-centered. Teacher was functioning as a facilitator and a mediator in learning process. The curriculum emphasizes that the understanding of learning concept for learners should be prioritized, so that learners were no longer rely on teachers as the only source of learning. The PBL concept in the Curriculum was expecting to have a positive impact for learners in improving their critical thinking ability.

Learners are strived to have a critical thinking ability for the following reasons (1) Critical thinking is an important component of problem solving besides creative thinking, because critical thinking was used for evaluating a problem's possible solutions (*Programme for International Students Assessment* (PISA) 2012: 13), (2) Critical thinking becomes the basis of students' ability to focus on classifying, analyzing, understanding, and predicting a problem solution with self-regulatory and regular assumptions (Masek dan Yamin, 2011: 218). Therefore, learners must have the ability to think critically and teachers must have an effort to improve learners' critical thinking skills in order to implement knowledges from learning into everyday life.

The Research from Masek and Yamin (2011: 220) shows that (1) certain process in PBL theoretically support learners to develop critical thinking skills according to the applied design, (2) empirical evidence is generally inconclusive to explaining the effect of PBL on the critical thinking ability of learners, (3) some evidences shows that PBL requires a long-term exposure to encourage learners' critical thinking skills, (4) some predictors may also affect the relation between PBL and critical thinking skills, such as age, gender, academic achievement, and educational background, for further research.

Based on the facts from the needs analysis questionnaire results, researcher assumes, it is needs a learning process that can involve learners more actively and learners can solve the existing problems in learner worksheet with critical ideas. The purpose of this research is to develops a PBL model learner worksheet and to knows the effectiveness of PBL model learner worksheet on the learners' critical thinking ability.

## II. Methods

The used research method is *Research and Development (R&D)* method. The following steps to use Research and Development (R & D) method referring to Borg & Gall model (2003: 569-575) are; 1) Research and information gathering, 2) Planning, 3) collecting the format of the initial product, 4) Initial trial, 5) Product revision, 6) Field trial, 7) Product revision, 8) Field trial, 9) Final product revision, 10) dissemination and implementation. The steps taken in this study was until the seventh step, product revision. This is due to the researcher's limited time and cost to perform the next steps.

The population of this research is elementary school's class IV students in Kedamaian sub-district, Bandar Lampung City, and sample was taken by using random sampling method by researcher by taking 2 classes from Public Elementary School 1 of Kalibalau Kencana and was concluded that the class IV A with total of 35 students as the experimental class and class IV B with total of 35 students as the control class.

The instruments of this study are questionnaire of needs analysis, material and media expert's validation sheets, and pretest-posttest questions to measure the improvement of learners' critical thinking ability.

Data collection techniques in this study was used this following way: 1) test, the test consists of initial test (pre-test) and final test (post-test). The test was used to obtain data of student learning result on the Theme of "My Heroes" Sub-theme of "Heroism Attitude" for 4th grader class. The form of data is quantitative data that obtained through the tests given to the class IV students of Public Elementary School 1 of Kalibalau Kencana. The data of learners' learning results were used to determine the effectiveness of PBL model learner worksheet on improving learners' thinking ability; 2) questionaire, questionnaire in this research was aimed at classroom teachers to digging data according to research problem, which then analyzed to develop the learner worksheet. Questionnaire was also used to collect data from media and material expert's test for learner worksheet product. The data that obtained through the questionnaire in the form of quantitative data were described qualitatively in the discussion; 3) documentation, this documentation process was intended to get the total of learners data and the scores of daily test data of theme 1 from class IV students in Public Elementary School 1 of Kalibalau Kencana, Bandar Lampung. Then, on the research implementation, researcher using this technique to documenting some of the school archives and the learning activities.

Data analysis techniques in this study are validity test, reliability test, difficulty test and power differentiator test of the questions that was used to test the pretest-posttest instrument, and also an effectivity test to calculate the obtained quantitative data from pre-test and post-test result which was analyzed quantitatively to know the improvement of learners critical thinking ability as seen from the improvement of learning results before and after using PBL model learner worksheet.

## III. Result And Discussion

**Research Results**

The results of the developmental research of PBL model learner worksheet on the theme of "My Heroes" sub-theme of "Heroism Attitudes" to improve critical thinking ability of 4th grader students from Public Elementary School 1 of Kalibalau Kencana, Bandar Lampung, was obtained this following results.

**Research and Information Gathering**

Research and information gathering was done by conducting preliminary study in the form of observation through questionnaires spreading. The observation was conducted on August 7, 2017 at class IV of Public Elementary School 1 of Kalibalau Kencana. The activitiy is field observation to identify potentials or problems. Observation was conducted as preliminary research activities to collect preliminary data using the questionnaires which was used as the basis of development. The obtained data was in the form of learning conditions description which include the teaching material that used in learning process, the infrastructures, and the learners' learning outcome.

Based on the preliminary study, the observation results of teacher needs analysis in this research of PBL model learner worksheet to improve critical thinking ability of class IV students at Public Elementary School 1 of Kalibalau Kencana, Bandar Lampung, researcher obtained this following data: 1) the learning scores from 31 of 105 students or 29.6% were still below the minimum passing score; 2) two of three teachers or 67% of teachers have never using a PBL model learner worksheet and the limitation of learners in the use of learner worksheet are visible; 3) all teachers who fill the needs analysis questionnaire with total of three teachers or 100% of teachers stated that it is necessary to develop a PBL model learner worksheet to improve the learners' critical thinking ability.

**Planning**

Planning of instructional design in this research was using PBL model to produce a product in the form of learner worksheet as an effort to improve critical thinking ability. Then, formulates the learning objectives, *i.e.* the objectives that should be achieved by learners after using PBL model of learner worksheet product.

**Development of Initial Product Format**

The development of initial product format was adjusted to the learner worksheet framework that has been compiled. Preparation of this initial product format consist of several parts, *i.e.* cover pages creation, foreword, table of contents, learner worksheet's instructions of use, basic competencies mapping and indicators, learning objectives and preparation of PBL model learner worksheet contents.

**Initial Trial**

The initial trial that was conducted by the experts aim to produce a product in the form of learner worksheet that can be used by learners. These preliminary trial consists of tests from material expert and media expert.

The test from material expert resulting a score of 89.70. The score validation sheet from the material expert's test can be seen in the appendix. Based on the obtained score (89,70), then, the learner worksheet that was developed by researcher have a qualitative criteria of "very good". Judging from the content's suitability, every aspect that assessed in the developed learner worksheet has met the eligibility criteria, because the used material was suitable with the Core Competencies and the Basic Competencies, the language aspects was considered to have met the language criteria that match the learners' level of development. Furthermore, the presentation aspect of the used images was suitable with the learners' level of knowledge and the used cover page also reflects the theme of "My Hero", sub-theme of "Heroism Attitudes".

Based on the data analysis from material expert's validation results, the developed learner worksheet can be said as valid and can be implemented, although there are still some things that need to be revised according to the material expert's advices, such as, cover page should be more adjusted to learner worksheet's theme and material, the foreword should be adjusted to the PBL steps and questions in learner worksheet should encourage learners to furtherly improve their critical thinking ability, with question samples that use the question word "why, how".

The test from media expert obtaining a score of 90.38. The score validation sheet from the media expert's test can be seen in the appendix. Based on the obtained score (90,38), then, the learner worksheet that was developed by researcher have qualitative criteria of very good. It is reviewed from the learner worksheet media with the learner worksheet producing requirements which are consist of three assessment aspects, i.e. didactic, construction and technical requirements.

Based on the data analysis from media expert's validation results, the developed learner worksheet can be said as valid and can be implemented, although there are still some things that need to be revised according to media expert's advices, such as, the pictures and stories in the learner worksheet should have its source included, the PBL steps definition on the learner worksheet should be clear, the usage of shapes must be adjusted, learning indicators and objectives should be more adjusted and the bibliography should be further clarified as well.

**Product Revision**

Product revision was implemented after product validation that conducted by two experts, *i.e.* media expert and material expert on the previous step of research and development.

**Field Trial**

The field trial was done by conducting learning activities by implementing the learner worksheet product. This field trial was conducted on class IV learners at Public Elementary School 1 of Kalibalau Kencana. This is the following results that obtained from the field trial activities.

***Pretest-Posttest* Results**

The learners' learning results before (*pretest*) and after (*posttest*) using PBL model learner worksheet can be seen on this following table.

| Class | Average Score | | Increment | Increment (%) |
|---|---|---|---|---|
| | Pretest | Posttest | | |
| IV A | 54,57 | 71,43 | 16,86 | 23,60 |
| IV B | 54,42 | 66,30 | 11,88 | 17,91 |

The table above shows that there are generally an increment in the learning outcomes which was also shows the result of learners' critical thinking ability after learning using PBL model of learner worksheet on 5th theme 3rd sub-theme. In the experimental class, the learners' average learning score before learning by using PBL based learner worksheet was 54,57, it was then increased to 71,43 after they learning by using PBL model learner worksheet or an average increment of 23.60%. Meanwhile, the average learning score of pretest and posttest from the control class was 54,42, then increase to 66,30 with an average increment of 17,91%.

**Effectiveness Hypothesis Test**

Product effectiveness test was conducted to see a significant increases in the critical thinking ability that seen from learners' learning outcomes before and after learning using PBL model learner worksheet. *N-Gain* was used to analyze the improvement of learning outcomes before and after learning using PBL model

learner worksheet.This is the following result of *Pretest-Posttest* Gain after been calculated and presented in the following table.

| No | Public Elementary School 1 of Kalibalau Kencana | Gain |
|---|---|---|
| 1. | Class IV A ( Experiment) | 0.44 |
| 2. | Class IV B (Control) | 0,32 |
| Average | | 0,38 |

From the table above, the average Gain score shows a result of 0.38, which means that the normalized gain are in a moderate classification, then the effectiveness level is effective.

**Final Product Revision**

The final product revision was based on the results of the hypothesis test and the findings in the field when product was being tested. Based on the results of conducted hypothesis test, obtained an increasing of the learners' critical thinking ability, as seen from the increased learners' learning scores. Furthermore, based on the results of consultation to material expert and media expert, it is concluded that the learner worksheet with PBL model learning steps ;*i.e.* formulate problems, formulate hypotheses, collect data, analyze and conclude problems; can improves the critical thinking ability of learners, so it is no further revision and suitable to be implemented.

**Research Discussion**

Based on the conducted research, it was shown that the research results have increasing the pre-test and post-test scores on the field trial. Here is a discussion on the development of PBL model learner worksheet.

**Development of PBL Model learner worksheet**

The Development of PBL model learner worksheet in thematic lessons on the theme of "My Heroes" sub-theme of "Heroism Attitude", can be described as follows. The development of learner worksheet with PBL model adapts seven of ten steps of R&D by Borg & Gall (2003: 569-575), the first step is to research and collect the initial information, after researcher knows the occured problem, researcher does the planning to develop learner worksheet that will be used by learners, so it can increase the ability to think critically viewed from the learners' learning outcomes. Furthermore, researcher prepares the development of initial product of learner worksheet, in this step, researcher pours the development pattern that will be applied in PBL model learner worksheet. The next step was initial test, researcher conducted a validation test with two validators, with the aim to validating the developed product whether it is suitable or not with the requirements of development, so it is feasible to be tested. The results of validation test can be described as follows.

The assessment from material expert includes the suitability of learner worksheet with the content's quality and the suitability of the PBL model learner worksheet. Some of the material expert's advices for the product improvement were revising the cover page to be more matches with the theme and material contained in learner worksheet, the foreword should be adapted to the PBL steps and questions in learner worksheet should be further encourage learners to improve their critical thinking ability, with questions example that use the question word "why, how".

The assessment from media expert includes the learner worksheet making requirements *i.e.* didactic, construction, and technical requirements. Some advices from media expert for the product improvement were revising the images and the stories in learner worksheet to be provided with the source, the PBL steps' understanding on learner worksheet should be clear, the usage of shapes should be adjusted, learning indicators and objectives should be more customized and the bibliography should be further clarified as well.

After conducting the validation test, the researcher revises the product based on advices and comments from the validators. The next step is field trial, in this step, researcher tested the product to experimental class, it was obtained that data of learners' learning results was higher in posttest compared to learners' learning result on pretest. After that, then the effectiveness of learner worksheet were tested to know whether or not there is improvement of learners' critical thinking ability. Then, researcher made a revision to perfecting the product.

In effectivity test, it was obtained data that show the increases of learners' critical thinking ability, as seen from the higher learners' learning results on the post-test after learning using PBL model learner worksheet compared to the learners' results on pre-test before using PBL model learner worksheet in the learning process. Moreover, it can be seen from the N-Gain scores increment in both experimental class and control class which shows that N-Gain of experimental class was higher than N-Gain of control class. So it can be concluded that the developed product was effective for thematic learning and improve learners' critical thinking ability.

The student learning activities that contained in the PBL model learner worksheet was using five main components i.e. formulating problems, formulating hypotheses, collecting data, analyzing problems and concluding. Those five components were poured in the thematic learning activities for learners through the development of PBL model learner worksheet which makes the learners' activity be more active, so it can improve learners' critical thinking ability. According to the opinion of constructivism psychologist, Sukarjo (2012: 54), a learning theory that emphasizes that an individual can gains knowledges from the process of knowledges formation by linking the previously possessed knowledge to the knowledges that currently being studied by the individual independently.

PBL model learner worksheet was considered very appropriate because, in the learning step, learners are directly involved to solve problems and gain their understanding through a systematic PBL steps. This is in line with Hallinger's opinion (2011: 272) which reveals that the benefit of PBL is learners become more aware about how they can put their gained knowledge to use that.

This is in line with Venville (2010) which in the results of their research shows that learning with the PBL model can further improve learners' learning outcomes rather than learning with traditional model. In Kartal (2014), the results of their study proves that PBL can be more effective on the conceptual understanding in magnetic topic teaching than traditional teaching method. In Masek and Yamin (2011), their research results shows that (1) certain processes in PBL were theoretically support learners to develop their critical thinking ability in accordance with the applied design, (2) empirical evidence was generally not convincing in explaining the effect of PBL on the learners' critical thinking ability, especially studies other than the medical field, (3) some evidence suggests that PBL requires a long-term exposure to encourage learners' critical thinking skills, (4) some predictors may also affect the relation between PBL and critical thinking ability, such as age, gender, academic achievement, and educational background, for further research.

So, it can be concluded that the use of PBL model learner worksheet on the theme of "My Heroes", subtheme of "Heroism Attitude" was very helpful for learners in the learning process, can make learning activities to be more active and innovative, learners can find and solve their own problems by linking the material with their possessed knowledges and experiences in daiy life, it will make learners easier to absorb information and process new material, which will improving learners' critical thinking ability that can be seen from the improved and better learners' learning results. This learner worksheet can be used as an alternative teaching material in the learning process at classroom and as an independent learning material for learners.

**Effectivity of PBL Model learner worksheet**

The result of the development of PBL model learner worksheet to improve learners' critical thinking ability was effective to be used. This was proved from the learners' average score before and after using PBL model learner worksheet in learning process. This can happen because learners using PBL model learner worksheet in learning process through PBL model steps where learners are required to follow each stages in a systematic way.

The Learning theory that becomes the reference of this PBL model learner worksheet research development were *behaviorism*, cognitive and c*onstructivism* learning theory where, according to these theories, learning was not only about memorizing the subject mateialr, but learning is also a meaningful experience for learners. Learners find and transform complex information, check for new information and revise it if they do not suitable, all done by themselves.

According to Sukarjo and Ukim (2012: 34), the most important thing of this theory in learning is the input in the form of stimulus and output in the form of response. Stimulus is everything that teachers give to learners, while Response is learners' reaction or response to the stimulus given by the teacher. Suprijono (2014: 22) states that cognitive theory emphasizes learning as an internal process. Learning is an active mental process for achieving, remembering, and using knowledges. According to Asra (2009: 15), learning is a process of constructing knowledge based on the experience that were experienced by learners as a result of interaction with surrounding environment.

Therefore, the learning process should be designed and managed in such a way to encourage learners to organize their own experience into a meaningful knowledge. The effectiveness of learner worksheet as a teaching material was corroborated by Siaw's opinion (2016), the results showed that the application of PBL model gives a high influence to the improvement of learners' critical thinking attitude in Pei-Ying Tsai Elementary School (2013), the results of their research shows that through the application of PBL, learners' critical thinking ability were increased significantly between the experimental class who using PBL and the control class who using conventional model. In Wahyudi *et.al.* (2014), the results showed that the implementation of the developed learner worksheet through PBL learning model brings influence to learners' critical thinking ability. In, Kaymakci (2012), the results showed that the researches on learner worksheet development for the *problem solving skill* was still very low. This shows that the development of learner worksheet to see learners' *problem solving skill* can be conducted by using PBL model learner worksheet.

Based on those relevant theory and research, in this study the effectiveness of learning was measured through the learners' learning results, by looking at the high and low of learning scores obtained before and after using the PBL model learner worksheet. The effectiveness of learning can be seen from the increment of the average scores before and after using PBL model learner worksheet, moreover, the normalized Gain score of learning outcomes from the learners' that using PBL model learner worksheet in learning was includedd in the moderate category. This indicates that PBL model learner worksheet for improving students' critical thinking ability was included in the effective criteria.

**Advantages of PBL model learner worksheet Development**

This product development results ,according to researcher, have several advantages such as: 1) learner worksheet was arranged based on teachers' needs and in accordance with the Curriculum in Indonesia, 2) learner worksheet comes with a learning guide that allow learners to use, 3) every learning step of PBL model learner worksheet was arranged systematically, 4) PBL model learner worksheet was effective to improve learners' critical thinking ability, 5) PBL model learner worksheet make learners more active in learning and can solve problems in every task.

**Limitations of PBL model learner worksheet Development**

**Product Limitations**

The development of PBL model learner worksheet, besides has advantages, also has weakness or limitations. Some limitations on the PBL model learner worksheet product on the theme of "My Heroes", sub-theme of "Herosm Attitude" are as follows: 1) learner worksheet was created only with one sub-theme consisting of 6 lessons, so, its use was limited to only the 5th theme, 3rd sub-theme, 2) Research and Development should be conducted in 10 steps. Meanwhile, this developmental research was conducted only in 7 steps, this is due to researcher's limited time and cost, 3) assessment in the Curriculum should be included three domains: cognitive, affective, and psychomotor. In this developmental research, the presenting assessment of this PBL model learner worksheet and the question test instruments were limited to only the cognitive domain.

**Research Limitations**

The limitation of this research is that the research instrument was only tested once, so there is any possibility that some learners do not seriously responded to the instrument, so it is possible that the trial results not as expected. moreover, researcher only use one school as a research place, so there is a possibility of different results when its conducted in another school. Another limitation in this developmental research was the development of learner worksheet limited to only one sub-theme with six lessons, so it is considered to have no selling point.

## IV. Conclusion

Based on the results of research and discussion, it can be concluded as follows.

PBL model learner worksheet was arranged and developed based on the learner's needs analysis and refers to the specified basic competencies. This learner worksheet was feasible to be used based on the validation of material expert and media expert, which showed by "very good" category from the results of field trial. The developed PBL model learner worksheet was effectively improves learners' critical thinking ability.

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Nayank Ragilia. "Development of Problem Based Learning Model Learner Worksheet To Improve Critical Thinking Ability." IOSR Journal of Research & Method in Education (IOSR-JRME), vol. 8, no. 1, 2018, pp. 65-72.