Journal of Education and Practice
ISSN 2222-1735 (Paper) ISSN 2222-288X (Online)
Vol.9, No.18, 2018


# The Development of Critical Thinking Assesment Instrument on Elementary School Learning

Pargito[1*] Lilik Sabdaningtyas[2] Diyan Purnamasari[2]

[1] Faculty Education and Training Teacher, University of Lampung, Lampung, Indonesia
[2] Faculty Education and Training Teacher, University of Lampung, Lampung, Indonesia

* E-mail of the corresponding author: pargitodr@gmail.com

**Abstract**

This study aims to develop a valid, reliable, and effective critical thinking assessment instrument used as an assessment instrument for elementary school learning. The used research type was research and development based on Borg&Gall. The population and sample were 4th grader students with total of 50 students from Elementary Schools in Bandarlampung City. Data were collected through questionnaires and test questions. The results of reliability test is the price of"r" at 0,945. Validity test results indicate that the instrument meets the content, construct, and concurrent validity. The result of an instrument test canit was concluded that students' critical thinking ability was good enough. This can be seen from the average value of the trial results of 36.00 in a scale of 100.

**Keywords:** Instrument, Asessment, Critical Thinking

## 1. Introduction

Generation Indonesia will be faced with demographic bonus around 2025-2035. The demographic bonus is the condition of the population in which the young population is more stout than the aged population. These are the children of the Golden Generation cadres, because later in 2045 they will become the holder of government and the wheel of life in Indonesia. The gold generation is a generation with forward-looking vision, adequate competence, solid character, high intelligence, and competitive. Therefore, this gold generation must be prepared properly, ranging from elementary school, junior high school, senior high school, and college.

Education has an important role to creating gold generations of Indonesia who are characterize, intelligence, productive, and competitive. The effort to realize these expectations would require humans who are not only thinking smart from memorizing activities, but also thinking intelligence that formed by habituation process to solve problems, critical thinking and creative thinking. One factor that influences this success is teachers' ability to assessing and evaluating the learning process. Such capability is necessary to knows whether or not that the defined learning objectives in the curriculum have been achieved. In addition, that ability can also be used to revise or improve the learning process that has been done by teachers.

Based on the result of PISA analysis reported by Organization for Economic Cooperation and Development (OECD), Indonesia only ranked 64th out of 65 countries (OECD, 2012). The result of this study showed that the average Indonesian learners are only able to recognize a number of basic facts but not be able to communicate, relate, or even apply some abstract and complex concepts. This is because Indonesian learners are less stimulated to improve High-order Thinking Skills (HOTS) like critical and creative thinking.

The thinking ability is closely related to intelligence. According to Gardner (2011, p. 64), someone's intelligence is not measured by standard psychological test, but can be seen from their habit of two things. First, someone's habit of solving the problem. Second, someone's habit to create new products that have cultural value (*creativity*). The concept of critical thinking is now an important part of both statements above. Bailin *et al.*, (1999:286) mentioned that critical thinking is about teaching students to appropriately use concepts, principles, and procedures, so that they are capable of producing fruitful outcomes and critical judgments.

According to Widarto, Parjono and Widodo (2012, p. 410), students are required to have eight core competencies in the 21st century education, *i.e*. (1) communication skills, (2) critical and creative thinking skills, (3) inquiry/reasoning skills, (4) interpersonal skills, (5) multicultural /multilingual literacy, (6) problem solving, (7) information/ digital literacy; and (8) technological skills. Therefore, critical thinking skill is one of eight skills that are expected to be applied in learning, especially in elementary school learning. For critical thinker, when faced to a problem, their critical thinking ability will encourage them to continue learning to solve the problem. They remain consistent to think logically to solve the problem and try to live rationally and emphatically (Arifin, 2014, p. 74). According to Conklin (2012, pp. 86-88), the simple reason that makes why critical thinking skills are important is because successful / excel learners in school will grow up into adults who can make a positive

contribution to society.

R. H Ennis (2001, p. 125) have formulated 12 indicators of critical thinking skills that divided into five major groups, *i.e.*: 1) able to provide simple explanation, such as focusing a question, analyzing an argument, and making questions or answers about an explanation, 2) able to build basic skills, such as considering credibility of a source, observing and considering an observation report, 3) able to make a conclusion, such as deducting and considering deduction results, inducing and considering induced results, making and determining consideration value, 4) provides further explanation, such as defining terms and considering definitions, 5) identify assumption.

This critical thinking skill will be difficult to measure or monitor if the assessments only focus on low-level cognitive assesments. Assessment information is needed to make decisions about learners' learning abilities, placement them at appropriate levels and their achievements (Kankam, et., 2015, p. 62) It was proved from many field observations which obtained a result that learning patterns tend to be memorizing, often used in the form of a written test. Teachers' tests are still at the level of low-level thinking skills (C1-C3) taken from the sample problem or copy paste from existing sources. The teacher in making the problem is not accompanied by making the grid problem, so the matter does not pay attention to the level of thinking ability of learners. If examined from existing test instruments have not demanded learners to develop their critical thinking skills. The fulfillment of questions that lead to the ability of high-level thinking in each elementary school are less than 8%. Ideally, formative tests implemented by 25% teachers includes high-level thinking skill (Standar Penilaian BAN, 2012). Furthermore, total of 87.50% teachers did not have and did not know how to make a critical thinking assessment instrument on elementary school learning.

Assessment is a teacher activity intended to measure a particular competence or ability to the activities that have been implemented in the learning activities (Hosnan, 2014, p. 387). Assessment information is needed to make decisions about learners' abilities, based on their ability and achievement (Kankam Boadu, et al. 2015, p. 62). This study refers to the results of Klenowski (2009, p. 51) study which shows that the presence of assessment in learning is proven to help develop the thinking ability of learners. According to Bentri, et. Al (2016, p.1010) the assesment generally cover the cognitive,affective, and psycomotoric aspects. This is so goal the assesment by teacher is authentic (comprehensive).

This research is in accordance to Arifin (2014, p.85) research results which explains, based on the developed test instrument product, the critical thinking ability in mathematics at class X are not good. This is indicated by the average score of test result with less than 65, which is 26,38 of 100 score scale. Research result from Sada, Adnan, *et.al.* (2016) describes that in critical thinking skills development, learners can be trained through the use of learning models or methods that accustom them to do high-order thinking skills. In addition, to see learners' critical thinking ability, it can be measured based on the results of their assessment. According to Bahr, Nan (2010, pp. 85-88), every learner in general has confidence in their ability to think critically by identifying their activities in classroom. Furthermore, in research from Kusuma *et al.* (2017, p.145 ), Their ability to think, developing or not, is depends on how the teacher habituates them in the learning processmentioned that the assessment of HOTS Instruments is an assessment for effective learning to train students' HOTS and measure the effectivity of students' thinking ability according to the thinking level of each student. An assessment result which conducted by teacher, can be trusted if the teacher assess the same subject multiple times, and still obtained a relatively similar or reliable result (Arifin, 2014, p. 78.).

Therefore, this study aims to determine the development of valid assessment instruments that are valid and reliable in measuring the critical thinking skills of students in grade IV Primary School.

## 2. Research Method

The type of research that used in this research is *Research and Development* (R&D) model Borg & Gall (1989, p. 781). The product is an assessment instrument to train learners to have critical thinking skills. Research and Development (R&D) model Borg & Gall consist of steps as follows: (1) Research and information collecting; (2) Planning; (3) Develop preliminary from product;(4) Preliminary field testing; (5) Main product revision; (6) Main field testing; (7) Operating product revision. Based on those 10 steps, researcher determine to implement it until the 7th step.

The population in this study is all 4th grader students at Public Elementary School of East Tanjung Karang Sub-district, Bandar Lampung, which has implemented the 2013 curriculum. The sampling technique is using *purpose sampling* technique. Total samples of this research is 50 individual of learners from Public Elementary School 1 and Public Elementary School 3 of Sawah Lama.

 

The validity test includes content, and construct validity. The content validity test was done through the study of the instrument by the supervisor 2 as the evaluation expert, supervisor 2 as language expert, and supervisor 2 as material exper. Validity test performed with validation techniques by expert (judgment experts) through questionnaires validation. The analysis of instrument feasibility was obtained from the product validation score which calculated using this following formula:

$$\text{Final Score} = \frac{obtained\ score}{maximum\ score} \times 100$$

Reliability testing was done by calculating the coefficient of reliability. Test of characteristics by determining the level of difficulty, discrimination power, and the proportion or ratio of critical thingking category in the instrument. The developed instrument will be used as a learning assessment that train their critical thinking skills. Categories of critical thinking are shown in table 1.

**Table 1. Critical Thinking Categories**

| Categories | Thinking Level |
|---|---|
| 100 – 76 | Very Good |
| 75 – 51 | Good |
| 50 – 26 | Enough |
| 25 – 1 | Low |

(adapted from Lewy, 2009)

### 3. Research Results and Discussion

Research and development is done was 50 students of 4$^{th}$ grade of Elementary School in Tanjung Karang Timur sub-district, Bandar Lampung City. Research subjects amounted to 50 students consisting of class IV in SDN 1 Sawah Lama and SDN 3 Sawah Lama. The research design used is the type of research development of Brog & Gall. The development of critical thinking assessment instruments begins with initial research and information gathering, then planning, developing initial product drafts, initial product trials, then revising the initial product, testing small groups, and testing large groups, then revising the final product and ending with production mass.

This research is a development research that begins by conducting preliminary research on the critical thinking ability of learners in SD Tanjung Karang Timur Sub-district Bandar Lampung City. If examined from the existing test instrument has not demanded the students to develop their critical thinking ability. This critical thinking ability will be difficult to measure or monitor if judgments are focused on low-level cognitive judgments. Assessment is a teacher activity intended to measure a particular competence or ability to the activities that have been implemented in the learning activities (Hosnan, 2014, p. 387. Assessment information is needed to make decisions about learners' abilities, based on their ability and achievement (Kankam Boadu, et al. , 2015, p. 62).

This study refers to research conducted by Ngang, Subadrah Nair, and Bouphan Prachak (2014, pp. 145-147) which states that thinking skills are very important in the Malaysian national school curriculum especially at the primary and secondary levels. In addition, based on Abosalem (2016, p. 78) research results on high-level thinking skills assessment techniques show that by using HOTS assessment, this will assist students in evaluating their thinking skills.

The assessment instrument developed has passed several stages, ranging from the fulfillment of the rules of writing questions, validation theoretically and validation empirically. The development of this product is focused on developing assessment instruments that require learners to develop their critical thinking skills. The form of the instrument developed in this study is the question of multiple choice tests, since the multiple choice test consists of a statement of questions with several alternative answers. Various alternative answers are offered, only one correct answer, the other is a liar. This requires learners to be more observant in choosing answers.

The development of this product is focused on developing assessment instruments that require learners to develop their critical thinking skills. The form of the instrument developed in this study is the question of multiple choice test. According to Harjanto (2006, pp. 280-281) the way of preparing multiple choice questions is as follows (a) The statements should clearly formulate a problem; (b) The statement and choice are not long sentences; (c) The choice of answers should be homogeneous. (d) Enter most words in the main part of the

question; (e) Stating the subject with a positive.

The assessment instrument developed has passed several stages, ranging from the fulfillment of the rules of writing questions, validation theoretically and validation empirically. Each item in this assessment instrument uses an indicator of critical thinking skills. There are 5 indicators of critical thinking skills developed namely, interpretation, analysis, concluding, and evaluation. Each item question contains an indicator that can train their critical thinking skills.

### 3.1 Validity of Assessment Instruments

This validity test is performed using expert judgment. Aspects assessed include 3 things, namely: (1) material; (2) construction; and (3) languages. The test is performed by submitting a set of assessment instruments consisting of grids, question cards, instrument forms, answer keys and scoring guides. Then the expert is asked to assess the suitability of the instrument with the indicator that is on the questionnaire sheet. Based on the expert review, the developed instrument is declared eligible for trial after the revision. The result of construct validity test obtained from expert assessment can be seen in Table 2. Based on the result shown in Table 2 it can be concluded that the critical thinking appraisal instrument developed including the categorical greetings is very valid.

**Table 2. Construct Validity Results**

| No | Aspect | Score (%)) | | | | | Average (%) | Description |
|---|---|---|---|---|---|---|---|---|
| | | Validator 1 | Validator 2 | Validator 3 | Validator 4 | Validator 5 | | |
| 1 | Matter | 95 | 95 | 95 | 90 | 100 | 95 | Very Good |
| 2 | Construction | 95 | 80 | 95 | 85 | 90 | 86 | Very Good |
| 3 | Language | 80 | 90 | 100 | 95 | 95 | 92 | Very Good |
| Validation of Construct | | | | | | | 91 | Very Good |

Based on the validation result of expert lecturers (*expert judgment)* and practitioners, obtained the average a score of material expert validation is 95,00% (very good), a score of construction aspect validation is 86,00% (very good), and a score of language aspect validation is 92.00% (very good). These results suggest that the instrument has very good validity in measuring critical thinking skills. However, there are some questions that need to be fixed according to advices and suggestions from the 5 validators, such as; indicator that not suitable with question items, sentence formula writing, image selection, completeness of introductory information *(stimulus)*, and answer choices. Thus, the instrument is declared feasible to be tested after the revision

### 3.2 Quality Instrument Assessment of Critical Thinking

After conducting the experts validation, then it is followed by a trial to see the quality of the developed question items including reliability, distinguishing power, difficulty level, and distractor. A limited trial was conducted at Public Elementary School 2 of Sawah Lama with total sample of 24 individuals. The number of early developed assessment instruments are 40 questions. However, after validity test, only 30 questions are valid.

#### 3.2.1 Instrument Reliability

The purpose of this research development, not only want to produce a valid instrument, but also want to produce a reliable instrument. The reliability test results are presented in table 3.

**Table 3. Reliability of Critical Thinking Instrument**

| Item's Number | r value | Criteria |
|---|---|---|
| 1-30 | 0,945 | Very Strong |

Based on the table, it can be seen that the questions reliability level is categorized as "very strong" with total r score of 0,945.

#### 3.2.2 Difficulty Level

The next step of analysis is to determine the difficulty level for each question item. To know the difficulty level of the developed instrument, it can be seen in table 4.

**Table 4. Difficulty Level of Multiple Choices Question Product**

| Category | Question Item's Number | Total | % |
|---|---|---|---|
| 0,00-0,30 (Hard) | 1,2,5,11, 12,13, 17, 20,22,28 | 10 | 33,33% |
| 0,31-0,70 (Medium) | 3,4,6,7,8, 9,10,14, 15, 16,21, 23, 24,25, 26, 27,29, 30. | 20 | 66,67% |
| ≥0,71 (Easy) | 0 | 0 | 0 |

Based on the table, it can be concluded that 66.67% of developed test questions are categorized as medium category, and 33.33% as hard category.

### 3.2.3 Distinguishing Power

The next step of analysis is to determine the distinguishing power for each questions item. The following reliability test results are presented in table 5.

**Tabel 5. Distinguishing Power of Multiple Choices Questions Product**

| Distinguishing Power Index | Item's Number | Annotation |
|---|---|---|
| 0,70-1,00 | 8, 18, 23 | Very Good |
| 0,40-0,69 | 1, 2, 3, 4, 5,7, 9, 10, 11, 12, 14, 15, 20, 21, 22, 24, 25, 26, 27,28,29,30 | Good |
| 0,20-0,39 | 6, 13, 16, 17, 19 | Pretty Good |
| 0,00-0,19 | 0 | Bad |
| Negatif | 0 | Not Good |

Based on the table, it can be concluded that 66.67% of developed test questions are categorized as medium category, and 33.33% as hard category.

### 3.2.4 Distracting Power (Distractor)

The spread of answer choices /*options* (distractor) of multiple choice question items can be seen in table 6 below.

**Table 6. Effectivity of Distractor on Multiple Choices Questions' Product**

| Category | Item's Numbers | Total | % |
|---|---|---|---|
| rpbis positive answer key, Response ≥5%, and rpbis negative distractor | 1, 2, 3, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 24, 25, 26, 27, 28, 29, 30 | 27 | 90,00 |
| rpbis negative answer key, Response ≤ 5%, and rpbis positive distractor | 4,10, 22 | 3 | 10,00 |

Based on the table, it can be seen that the total of question item with the spread of answer choices /*options* (pengecoh) that well functioned was 27 question items (90,00%).

The results of the data analysis show that the Critical Thinking Skills Instrument has good validity and reliability. The developed instrument is able to measure what exactly it wants to be measured, that is critical thinking Skills of fourth grade students of Elementary School. This is seen in the diversity of results that students do.

## 3.3 Analysis of Critical Thinking Ability Learners

Field trial of the product was conducted in class IV A at Public Elementary School 1 of Sawah Lama and class IV B at Public Elementary School 3 of Sawah Lama, Bandar Lampung City. Total of research subjects are 50 individuals. Field trial was conducted during 6 meetings for each school. The first five meetings were held to train learners critical thinking skills. Each meeting discusses a different topic. In these meetings, there are a process of teaching and learning, so that students can understand the topic and also can solve the prepared

 

critical thinking skill questions as a learning assessment.

Assessment instrument contains several indicators that used to train students' thinking skills. Meanwhile, one final meeting was used to test the effectiveness of the developed assessment instrument in measuring learners' thinking skill based on their thinking ability. Before conducts the first lesson, learners do a pre-test first. After follows the learning process, students do a post-test, this aims to know the effectiveness of the assessment instrument in training learners' critical thinking ability. Based on the results of research, it shows that categories of learners' early thinking skills can be seen in table 7 below.

**Table 7.Critical Thinking Categories**

| Categories | Total | Percentage |
|---|---|---|
| Very Good | 8 | 16,00 % |
| Good | 14 | 28,00 % |
| Pretty Good | 18 | 36,00 % |
| Low | 10 | 20,00 % |
| **Total** | 50 | 100 % |

Based on the above table shows that the critical thinking skills of learners are mostly in the category quite well. It is known that from 50 test subjects there are 8 students (16.00%) included in the category have excellent critical thinking ability, 14 students (28.00%) included in category have good critical thinking ability, 18 students (36, 00%) belonging to the category have enough critical thinking ability, 10 students (20.00%) included in category have low critical thinking ability.

To know the critical thinking ability of learners, then the analysis of the indicators that diteskan. These indicators include indicators "analyzing questions", "interpreting answers" 'Ability to evaluate "concluding skills, and" defining alternatives to solving problems ". The results of analysis per indicator of critical thinking ability can be seen in table 8.

**Table 8 Results Analysis Per Indicator of Critical Thinking Skills**

| No | Indicator | Presentase | Category |
|---|---|---|---|
| **1** | Ability to analyze | 82,99% | High |
| **2** | Ability to interpret answers | 78,47% | High |
| **3** | Ability to evaluate | 68,75% | Medium |
| **4** | Ability to conclude | 62,15% | Medium |

Table 8 shows that the highest score indicator is the "question analysis" of 82.99% with the high category while the lowest score indicator is a "conclude statement" of 62.15% with sufficient category..

In terms of "analyzing questions", learners who can work correctly are 82.99%. This means that students have been able to analyze the questions by identifying all the information and writing them correctly and correctly. Cause other students have not been able to analyze the question by writing is known that the ability of students in interpreting language is still lacking. In terms of "interpreting answers", learners who can work correctly are 78.47% included in the moderate category. This means that the student is able to adequately focus the question by formulating the problem or question and selecting the correct answer. Cause other students have not been able to focus menginterprestasi answers because students are less careful and meticulous in doing it other than that students also can not describe the existing stimulus.

In terms of "evaluating" learners who can work correctly is 68.75% included in the category enough. This shows that there are still many students who have not been able to evaluate by using the concept / fact in solving the problem. This is because In the process of learning so far does not teach the techniques, procedures, and evaluation given to students only in the form of exercise questions with the level of ordinary problems. In terms of "concluding" learners who can work correctly as much as 62.15% included in the category of being. This indicates that the student is sufficiently able to write down the answer or solution of the problem in the matter by showing the main results and the procedure correctly in the answer section.

Based on the above exposure can be concluded that there are still indicators that can not be done students. The average test result of students in the classical 55.04% is included in the low category. This indicates that the critical thinking ability of fourth grade students of SD Kota Tanjung Karang Timur needs to be trained again so that students' thinking ability can develop. The result of the average percentage obtained at the school must be at least in the high category so that students are said to be able to think critically. Johnson (in Lambertus, 2009, p.65) states that using higher-order thinking skills in the right context teaches students the habit of deep thinking, living habits, with a smart, balanced, and accountable approach.

In line with that opinion, students' critical thinking skills can still be developed with appropriate efforts. This is in accordance with the opinion of Bloom ( in Iskandar, 2009, p. 90) that critical thinking can be improved through higher-order thinking, ie from application level to level of evaluation (evaluation). In addition, according to Sagala (in Iskandar, 2009, p. 101) in the learning process should be built dialogical atmosphere and continuous question and answer that is directed to improvement and improvement of students' thinking ability. The critical thinking skills of the students will develop if supported by the efforts undertaken by the teacher

The results of this study were also relevant to Arifin's research (2014, p.86) which resulted in a product of measuring instruments of critical thinking skills of mathematics of class X students. The results of the test instrument can be concluded that the critical thinking skills of students of mathematics class X less good. This is indicated by the average value of test results of less than 65, which is equal to 26.38 on a scale of 100.

Based on explanation above, the developed test instrument meets the criteria of valid and reliable. In this case, the usage of critical thinking assesment instrument was one alternative for teachers to train and determine students' thinking level based on their ability to answer the provided questions. This help teachers to know how good their student's thinking ability are. The influence of critical thinking skills on learning outcomes is not so great, it is understood that not only critical thinking skills affect student learning outcomes, but there are other factors that influence learning outcomes, including family, economic, and cultural conditions. In addition, it can also influence teacher teaching strategies, facilities and school facilities, as well as the environment around the school.

## 4 Conclusion

Based on the result of research and discussion, it is concluded that the final product in this study is an assessment instrument to measure the critical thinking skills of 4th grader elementary school students. The developed questions are suitable with writing question rules. The validity of the instrument is evidenced by the results of the expert's judgment indicating that the instrument is worthy of use based on material, construc- tion, and language aspects. The instrument also meets reliable criteria. The multiple-choice question has a moderate degree of difficulty, good distinguishing power, all of the cleverly functioning.. The instrument products are effective in measuring their critical thinking skills based on their level of ability. In this case, the use of critical thinking appraisal instruments is one of the alternatives for teachers to train and determine the level of thinking of students based on the ability to answer the questions they provide.

## References

Abosalem, Yousef. (2016).Assessment Techniques and Students Higher-Order Thinking Skills.*International Journal of Secondary Education*, 4 (1): pp. 1-11. http://www.sciencepublishinggroup.com/j/ijsedu.

Arifin, Zaenal. (2014). Pengembangan Instrumen Pengukur Berpikir Kritis Matematika Peserta didik SMA Kelas X dalam *jurnal THEOREMS (The Origibal Research Mathematic).*

Bahr, Nan. (2010). Thinking Critically about Critical Thinking in Higher Education dalam *International Journal for the Scholarship of Teaching and Learning*( Vol. 4: No. 2, Articel 9).

Bailin, S. et al. (1999). Conceptualizing Critical Thingking. *Journal Curriculum Studies*. (Volume 3 Number 31 pages 285-302).

Bentri, Alwen., Abna Hidayati, Ulfia Rahmi (2016). *The* Problem Analysis in Applying Instrument ofAuthentic Assessment in 2013 Curriculum dalam *International Journal of Science and Research (IJSR) 10 Oktober 2016 (Volume 5, Halaman 1008-1012).*

Brog, Walter R., and Gall, Meredith Damien. (1989). *Education Research*. New York: Longman.

Conklin, W. (2012). *High Order Thinking Skill to Develop 21st century learners*. Huntington Beach, California: Shell Education.

Ennis, R. (1993). H. *Critical Thinking Assessment Theory into Practic.* Vol. 32 (2), Summer 1993: 179-186.

Gardner, Howard. (2011). *Frames of Mind; The Theory of Multiple Intelligence* (e-book). Perseus Book Group. New York.

[ankam Boadu, Anthony Bordoh, Isaac Eshun, Thoephilus Kweku Bassaw, Fredrick Yaw Korang. (2015). Teachers' perception of authentic assessment techniques practice in social studies lessons in senior high schools in Ghana. *International Journal of Educational Research and Information Science.* 10 Januari 2015. (Volume 1 No 4 pp 62-68).

Klenowski, V. (2009). Assesment for Learning revisited: an Asia-Fasific perspective. *Assesment in Education: Principles, Policy,Practice.* Vol. 16, No 3, November 2009, pp. 263-268.

Kusuma, Merta Dhewa., Rosidin, Undang., Abdurrahman, and Agus Suyatna. 2017. about The Development of Higher Order Thinking Skill (Hots) Instrument Assessment In Physics Study inside *IOSR Journal of Research & Method in Education (IOSR-JRME) Volume 7, Issue 1 Ver. V (Jan. - Feb. 2017), pp. 26-32.*

Mardapi, D. (2012). *Pengukuran Penilaian Evaluasi Pendidikan*. Yogyakarta: Nuha Medika.

Mason, M. (2010). *Critical thinking and learning*. New York, NY: Wiley.

Ngang, Subadrah Nair, dan Bouphan Prachak. (2014). Developing Instruments to Measure Thinking Skills and Problem Solving Skills among Malaysian Primary School Pupils dalam *Procedia - Social and Behavioral Sciences Volume 116, Pages 3760-3764*

Nur Miftahul Fuad , Susriyati Mahanal, dan Endang Suarsini. (2017). Improving Junior High Schools' Critical Thinking Skills Based on TestThree Different Models of Learning dalam *International Journal of Instruction Vol.10, No. 3, pp. 76-90.*

OECD. (2012). PISA: Science competencies for tomorrow world volume 1: Analysis. Rosewood. Drive: OECD

Sada, A. M, Mohd, Z. A, Adnan A and Yusri K. (2016). *Prospects* of Problem-Based Learning in Building Critical Thinking Skills among Technical College Students in Nigeria inside *Mediterranean Journal of Social Sciences MCSER Publishing, Rome-Italy* (Vol 7 Number 3, pp. 123)

[Widarto, Pardjono, and Noto Widodo. (2012). Pengembangan Model Pembelajaran Soft Skill dan Hard Skill untuk Siswa SMK dalam *Cakrawala Pendidikan, XXXI* Year, No 3, 2012, pp. 409-423.

Dr. Pargito, M.Pd. was born in Kebumen on April 14, 1959. He successfully completed his bachelor's degree majoring in Geography Education at IKIP University Semarang in 1984. He then graduated with a degree in IPS Education at University Education Indonesia graduated in 2000. In addition, he also earned a doctorate degree in IPS Elementary Education at University Education Indonesia in 2009. Currently he is registered as a Lecturer at Lampung University, Lampung Province, Indonesia

Dr. Lilik Sabdaningtyas, M.Pd.was born in Wonosobo on October 5,, 1956. She was successfully completed his a doctorate degree in PEP at University of Yogyakarta. Currently he is registered as a Lecturer at Lampung University, Lampung Province, Indonesia

Diyan Purnamasari, S.Pd, M.Pd.. was born in Kebumen on May 25, 1994. She successfully completed shis bachelor's degree majoring in Primary teacher educationat FKIP University Sof Lampung in 2016. She is currently finishing his education at graduate school, University of Lampung.