Fulfilment National Standard Education toward Achievement of Critical Thinking Ability and Science Process Skill in Indonesia

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ABSTRACT

This study aims to evaluate the fulfillment of national standards of education, and knowing the achievement of students' critical thinking ability and science process skills. This research uses descriptive research. The subject of this research is a physics teacher and student of grade XI IPA 4 in SMAN 2 Surakarta. Data collection method are used methods of observation, questionnaires, documentation, and interviews. Data analysis techniques are using quantitative descriptive analysis and qualitative descriptive analysis. The results showed that content standard and process standard have not been fully implemented in school with the percentage of fulfillment of process standard in an aspect of planning 85%, implementation aspect 53%, and evaluation aspect 80%. This leads to the achievement of critical thinking ability and the science process skills of learners are in a low category. The average percentage achievement of students' critical thinking ability is 31.4% and the average percentage achievement of students' science process skill is 27.6%.

Keywords: *Critical thinking ability, National standard education, Science process skill.*

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Highlights of this paper

- This study aims to evaluate the fulfillment of national standards of education, and knowing the achievement of students' critical thinking ability and science process skills.
- The results showed that content standard and process standard have not been fully implemented in school with the percentage of fulfillment of process standard in an aspect of planning 85%, implementation aspect 53%, and evaluation aspect 80%.

1. INTRODUCTION

The era of globalization and the Asean Economic Community (MEA) require the existence of human resources quality. Human resources quality has critical thinking, systematic, logical, creative, and willingness to work together effectively (Kurniati *et al*., 2016). Physics is one of the fields of science that is very instrumental in developing the quality of human resources.

Physics is a part of science that studies about events and phenomena in daily life (Pamungkas *et al*., 2018). The essence of physics, in general, is a process, product, and application. This emphasizes that physics learning should be implemented in its entirety, not only emphasizes the final results or products but also involving processes which make physics learning more meaningful.

Physics learning which implemented products, processes, and applications can be done by involving students in real experience to develop competencies, skills, and students thinking abilities. This helps to produce quality students which show critical thinking ability and science process skills. Critical thinking ability and science process skill are very important to be developed and mastered by students in the era of globalization. This is due to critical thinking ability and science process skills are needed in solving problems in education and daily life (Fahrianthi *et al*., 2016).

Critical thinking is a process of systematic thinking that allows students to formulate and decide their own beliefs and evaluate each decision clearly (Mahmuzah *et al*., 2014). Critical thinking does not only emphasize the process of gathering and concluding information, but also emphasize the process of giving a response or scientific assessment about information (Utami *et al*., 2016). Critical thinking will encourage students to understand problems and make alternative solutions to solve problems more practically (Zetriuslita *et al*., 2016). Critical thinking ability can make students involved actively in the learning process (Duron *et al*., 2006).

Science process skills are a skill that was used to build knowledge which can solve problems and formulate a result (Ozgelen, 2012). Science process skills usually refer to skills or abilities that should be had by scientists in conducting scientific discovery processes (Sukarno and Hamidah, 2013). Process skills aim to develop students' scientific skills (Abungu *et al*., 2014).

Science process skills are divided into two groups that are basic science process skills and integrated process skills. Basic science process skills are skills used in conducting scientific investigations such as: observing, asking questions, classifying, measuring, and predicting. Integrated science process skills are applications of science process skills which used for problem solving such as: identifying and defining variables, collecting and transforming data, creating data tables and graphs, describing relationships between variables, interpreting data, manipulating materials, recording data, formulating hypotheses, formulating hypotheses, designing investigation, making conclusions and generalizations (Karamustafaoğlu, 2011).

One of the efforts by the government in developing critical thinking ability and science process skills is a set of national education standards. National education standards aim to guarantee the quality of national education in order to educate students and form a student character and national civilization (Ikhwan, 2015). Critical thinking ability and science process skills can be realized if national education standards can be implemented. Therefore, the fulfillment of national education standards towards achievement educational quality such as critical thinking ability

and science process skills should be analyzed. The national education standards that will be reviewed in this study include content standard and process standard. This is due to the content standard and process standards have the most dominant influence on achieving educational quality. This is supported by the Ikhwan (2015) that analysis of content standards and process standards can be determining the quality of education.

Based on the description of the problem, then the problem is formulated as follows, 1) how is the implementation of national standards education in Indonesia, 2) how is the achievement of students critical thinking ability in Indonesia? 3) how is the achievement of science process skills at Indonesia.

2. METHOD

This type of research is quantitative descriptive research. The method used in this research is the survey method. This research uses survey research procedures by Biemer and Lyberg (2003) that is: 1) Research objective, 2) Concepts, 3) Questioner, 4) Population, 5) Sampling, 6) Data collection, 7) Data processing, 8) Interpretation. This research was conducted in the second semester on the academic year 2017/2018 in Indonesia especially at SMAN 2 Surakarta. The population in this study were students and physics teachers at SMAN 2 Surakarta. Sampling method uses random sampling and obtained the sample used in this study is a physics teacher and students of XI MIPA 4. Data collection methods used are observation, questionnaire, interview, and documentation.

The instruments used in this study were teacher and student observation sheets, teacher self-assessment questionnaire sheets, and interview sheets. The teacher observation sheet is used to assess the implementation of national education standards related to content standards and process standards. The student observation sheet is used to assess students critical thinking ability and science process skills. The self-assessment sheet is used to assess national education standards that cannot be measured during the learning process. The interview sheet is used to support the data obtained in the results of observations and self-assessment questionnaires.

The indicators on the observation sheet and the teacher's self-assessment questionnaire refer to Minister of Education and Culture No. 21 and 22 of 2016 which contain content standard and process standard. The indicators on the critical thinking ability observation sheet were adopted from the indicators of Ennis (2011) that is: 1) giving a simple explanation, 2) providing a basis for a decision, 3) concluding, 4) making further explanations, and 5) giving a response. The indicators on the observation sheet of science process skills were adopted from the indicators of Dimyati and Mudjiono (2002) that is: 1) observing, 2) classifying, 3) communicating, 4) measuring, 5) predicting, 6) concluding. The scale used in the observation sheet and questionnaire is the Guttman scale which is 1 and 0. Score 1 if done according to the indicator and score 0 if not done according to the indicator.

3. RESULTS

The observation sheet instrument of critical thinking ability and science process skills was analyzed to measure the validity and reliability of the instrument. The validity and reliability instrument using the SPSS 22 program which is testing the validity instrument use a correlation of product moment (Sugiyono and Wibowo, 2002) and reliability test is using Alpha cronbach (Uyanto, 2006). The value of product moment correlation on the results of the validity instrument and alpha cronbachon the results of reliability instrument were compared with r_{table}. The r_{tabel} value which used with a total sample of 26 students and a significance level of 5% is 0.388. If the value of product moment correlation and Alpha cronbachvalue are greater than r_{table} (0.388), it can be concluded that the item is valid and reliable (Arikunto, 2005). Data which analyzed on the observation sheet of critical thinking ability and science process skills are data on the indicators that are valid and reliable.

The validity results of the observation instruments of critical thinking with the SPSS 22 program can be seen in Table 1.

Table-1. The validity results of the observation instruments of critical thinking.

No	Indicator of critical thinking ability	Information	Score
1	Giving a simple explanation	Pearson correlation	,792**
		Sig. (2-tailed)	,000
2	Providing a basis for a decision	Pearson correlation	,553**
		Sig. (2-tailed)	,003
3	Concluding	Pearson correlation	,824**
		Sig. (2-tailed)	,000
4	Making further explanations	Pearson correlation	,496*
		Sig. (2-tailed)	,010
5	Giving a response	Pearson correlation	,619**
		Sig. (2-tailed)	,001

Source: Field study 2018.

In Table 1 it can be seen that the 5 indicators of the observation instrument of critical thinking ability have a product-moment correlation value greater than r_{table} (0.388). This shows that the instrument is valid which indicates that the instrument can measure critical thinking ability. In addition, the instrument of critical thinking ability was tested for reliability to measure the instrument's confidence index. The reliability test results of the observation instruments of critical thinking ability with the SPSS 22 program can be seen in Table 2.

Table-2. The reliability test results of the observation instruments of critical thinking ability.

No	Indicator of critical thinking ability	Scale variance if item deleted	Cronbach's alpha if item deleted
1	Giving a simple explanation	1,415	,542
2	Providing a basis for a decision	1,835	,684
3	Concluding	1,385	,513
4	Making further explanations	1,915	,711
5	Giving a response	1,766	,643

Source: Field study 2018.

In Table 2 it can be seen that the indicator of the observation instrument of critical thinking ability has a alpha cronbachvalue greater than r_{table} (0.388). This shows that the instrument is reliable which shows that the instrument has a high consistency value. Based on Table 1 and Table 2 it can be concluded that all indicators on the observation instrument of critical thinking ability are valid and reliable so that all indicators of critical thinking ability can be analyzed descriptively to measure the achievement of students' critical thinking ability.

The validity results of the observation instruments of science process skills with the SPSS 22 program can be seen in Table 3.

In Table 3 it can be seen that 5 of the 6 indicators of observation instrument science process skills have a product-moment correlation value greater than r_{table} (0.388). This shows that the 5 indicators are valid which indicate that the instrument can measure critical thinking ability. 1 indicator is on the second indicator about classifying is invalid criteria so that this indicator cannot be used to measure the achievement of science process skills. Furthermore, the science process skill instrument was tested for reliability to measure the instrument reliability index.

The reliability test results of the observation instrument science process skills with the SPSS 22 program can be seen in Table 4.

Table-3. The validity test results of the observation instruments science process skills.

No	Indicator of science process skill	Information	Score
1	Observing	Pearson correlation	,765**
		Sig. (2-tailed)	,000
		N	26
2	Classifying	Pearson correlation	,371
		Sig. (2-tailed)	,062
		N	26
3	Communicating	Pearson correlation	,765**
		Sig. (2-tailed)	,000
		N	26
4	Measuring	Pearson correlation	,484*
		Sig. (2-tailed)	,012
		N	26
5	Predicting	Pearson correlation	,695**
		Sig. (2-tailed)	,000
		N	26
6	Concluding	Pearson correlation	,606**
		Sig. (2-tailed)	,001
		N	26

Source: Field study 2018.

Table-4. The reliability test results of the observation instrument of science process skills.

No	Indicator of science process skill	Scale variance if item deleted	Cronbach's alpha if item deleted
1	Observing	1,545	,585
2	Classifying	2,246	,707
3	Communicating	1,545	,585
4	Measuring	2,094	,685
5	Predicting	1,675	,627
6	Concluding	2,075	,643

Source: Field study 2018.

In Table 4 it can be seen that the indicator of the observation instrument science process skills has a alpha cronbachvalue greater than r_{table} (0.388). This shows that the instrument is reliable which shows that the instrument has a high consistency value. Based on Table 3 and Table 4 it can be concluded that the 5 indicators on the observation sheet of science process skills are valid and reliable so that the 5 indicators of science process skills can be analyzed descriptively to measure the achievement of students' science process skills.

The data analysis technique used in this study is qualitative descriptive analysis and quantitative descriptive analysis. Qualitative descriptive analysis techniques are used to process data from interview results by grouping information into predetermined aspects. This quantitative descriptive analysis technique is used to process data which obtained from observations and questionnaires in the form of descriptive percentages of fulfillment national education standards and achievement of critical thinking ability and science process skills of students.

4. DISCUSSION

The research objective is achieved by retrieving data on a subject that has been determined. The data obtained comes from teachers and students. Data obtained from XI grade teachers are in the form of observations, interviews and teacher self-assessment questionnaires. Data obtained from teachers is used to analyze fulfillment of national education standards. Data obtained from student observation are critical thinking ability and science process skills of students. Data obtained from students is used to analyze the achievement of critical thinking ability and student science process skills.

4.1. Analysis Results of National Education Standards

The national education standard that will be studied in this study is the content standard and process standards. This is due to these standards have the greatest influence on the achievement of educational quality in the form of critical thinking ability and science process skills of students.

The content standards which be analyzed in this study include suitability, curriculum relevance, and learning material. Based on the results of the self-assessment and interview questionnaires, the data shows that the percentage of fulfillment content standards related to the suitability and relevance of the curriculum is 100%. This is due to the teacher has compiled and developed learning tools in accordance with the BSNP guidelines and curriculum development has considered the characteristics of students and the learning needs of the syllabus. This is also supported based on the results of documentation obtained data related to curriculum support books such as syllabus and learning tools that are in accordance with BSNP guidelines.

On the other hand, there are problems with the content standard which related to learning material. This is based on the results of observations is indicating that the teaching concept of momentum and impulse has several errors that cause students confusion about the concept. Mismatch of teaching material occurs due to irregularities in explaining concepts such as the teacher explains the concept of impulse first, then continues with the concept of momentum. Based on the concept it can be seen that impulse is a change in momentum so that the concept of impulse should be obtained through the concept of momentum. This causes students difficulties in distinguishing momentum and impulses in daily life. In addition, the teacher also still has not emphasized the difference between positive and negative signs of momentum. This causes students to assume that the direction of speed does not affect the change in momentum. These problems also occur in research by Agustin *et al.* (2016) showing that students understand about speed is not a vector quantity. The process standard to be analyzed in this study includes aspects of planning, implementing, and evaluating learning. The percentage of fulfillment process standards in each aspect can be seen in Figure 1.

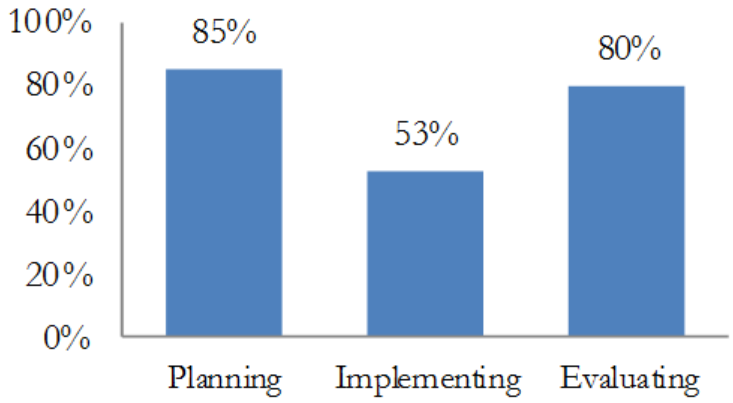

Figure-1. Percentage fulfillment of the standard process.
Source: Field study 2018.

In Figure 1 it can be seen that the percentage fulfillment of process standard in the planning aspect is 85%. This is due to there are still 3 indicators of 20 indicators that are still not fulfilled, that is the formulation of learning indicators, learning methods, and the design of preliminary activities. This is based on the results of the preliminary questionnaire and documentation obtained data that the teacher has not included aspects of the attitude on the learning indicator, the all learning method does not develop the abilities and skills of students, and preliminary activities still do not contain activities to motivate students. Though student motivation is

indispensable in improving learning achievement. This is supported in research by Suranto (2015) that learning motivation has a positive effect on learning achievement.

The percentage of process standard fulfillment in the implementation aspect of learning is 53% because there are 8 out of 17 indicators that are still not fulfilled, that is in the 4 indicators in the preliminary activity, 3 indicators on the core activities and 1 indicator in the closing activity. This is based on the results of observations obtained data that the teacher has not carried out preliminary activities such as motivating and learning objectives. The method used is the direct instruction method and not have yet a learning media to carry out practical activities so that it has not facilitated students in collecting and processing data. Teaching materials used are in the form of teaching materials originating from commercial publishers that have not contained problems that are able to develop the abilities and skills of students. In the closing activity, the teacher still did not do feedback on the learning process and results.

The percentage of fulfillment process standards in the aspect of assessment is 80%. This is because 2 of the 10 indicators have not been fulfilled. This is based on the results of the self-assessment questionnaire obtained data that there is still no assessment that assesses students' thinking skills and science process skills. The assessment used is only in the form of questions to assess students' understanding of concepts. The problem used is a problem from the previous year without first analyzing the item. In addition, the teacher rarely gives suggestion on the results of the assessment even though a suggestion or comments need to be given so that students are able to find out the errors in solving a problem.

4.2. Analysis Results of Critical Thinking Ability

The aspects of critical thinking ability which analyzed in this study are 1) giving a simple explanation, 2) providing a basis for a decision, 3) concluding, 4) making an explanation, and 5) giving a response. The results of the achievement of students' critical thinking ability in each aspect can be seen in Figure 2.

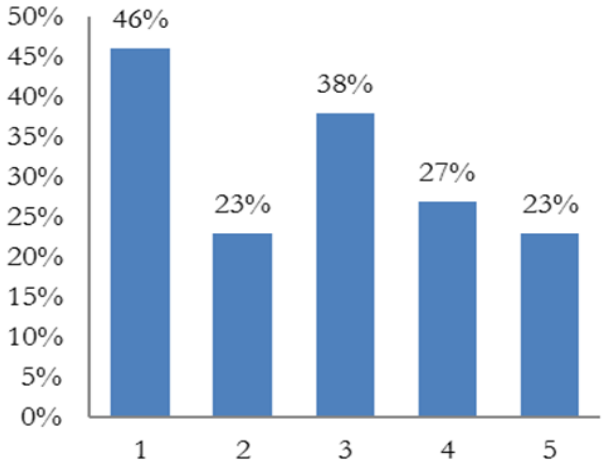

Figure-2. Percentage achievement of critical thinking ability.
Source: Field study 2018.

Figure 2 shows that students' critical thinking ability in each aspect are in the low category with an average percentage of critical thinking ability is 31.4%. The low category of students critical thinking ability is due to problems with content standard and process standards. The problem with content standards is the irregularity of conceptual explanations, which causes students to have difficulty in connecting between concepts, that is the concept of momentum and impulses. Problems in the standard process in the form of teaching materials and

methods used during the learning process have not been developed students' critical thinking ability. Learning activities begin with explaining concepts, giving examples of questions, and closing by giving practice questions. The learning emphasizes students in the memorization process rather than understanding concepts so that students can only apply formulas to a problem without knowing the meaning of the formula. This causes students' critical thinking ability became less developed. This is supported by Ismaimuza (2010) that teacher-centered learning causes students' critical thinking ability becomes low. This is also supported by Suratno and Kurniati (2017) that by involving students in activity learning can hone students critical thinking ability in solving problems.

4.3. Analysis Results of Science Process Skills

The aspects of science process skills which analyzed in this study are 1) observing, 2) communicating, 3) measuring, 4) predicting, and 5) concluding. The results of the achievement of science process skills in each aspect can be seen in Figure 3.

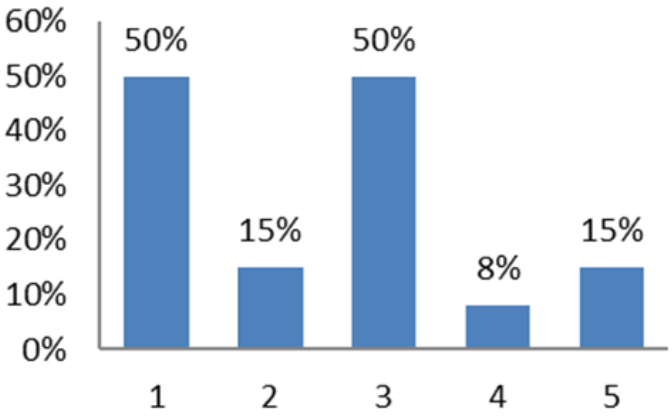

Figure-3. Percentage achievement of science process skill.
Source: Field study 2018.

Figure 3 shows that science process skills in the low category are in aspects of predicting, communicating, and concluding. The low category of science process skills is due to the inadequacy of standard processes, that is learning methods that do not support students' skills and not have yet real objects such as learning media. This is supported by Widayanto (2009) state that the low level of students science process skills due to students not to be involved with concrete objects in learning activities. In addition, teaching materials and assessments that do not support science process skills also contribute to students' low science process skills. This is supported based on research by Sukarno and Hamidah (2013) which states that the low level of students science process skill is caused by many factors, that is lack of teaching materials which can develop and improve student science process skill and lack of guidance in developing assessment of science process skills.

5. CONCLUSION

Based on the description of the results and discussion above, it can be concluded that there are still inadequacies in implementing national education standards, especially on process standards. The inadequacy of national education standards causes low achievement of students 'critical thinking ability and students' science process skills. The average percentage achievement of students 'critical thinking ability is 31.4%, while the average percentage achievement of students' science process skills is 27.6%. This shows that students' critical thinking ability and process science skills in the low category.

Based on the results of research that has been carried out, suggestions that can be given are: the methods used in the learning process must be able to develop the abilities and skills of students, besides that it also needs to be supported by the existence of learning media to support the learning process.

REFERENCES

Abungu, H.E., M.I. Okere and S.W. Wachanga, 2014. The effect of science process skills teaching approach on secondary school students' achievement in Chemistry in Nyando district, Kenya. Journal of Educational and Social Research, 4(6): 359-372.

Agustin, Yuliati and Zulaikah, 2016. Mistakes of high school students in solving momentum and impulse problems. Prosiding Seminar Nasional Pendidikan IPA Pascasarjana UM, 1(1): 174-183.

Arikunto, 2005. Research management. Jakarta: Rineka Cipta.

Biemer, P.P. and L.E. Lyberg, 2003. Introduction to survey quality. New Jersey: John Wiley & Sons, Inc.

Dimyati and Mudjiono, 2002. Learn and learning. Jakarta: Rineka Cipta.

Duron, R., B. Limbach and W. Waugh, 2006. Critical thinking framework for any discipline. International Journal of Teaching and Learning in Higher Education, 17(2): 160-166.

Ennis, R.H., 2011. The nature of critical thinking: An outline of critical thinking dispositions and abilities. Chacago: University of Illinois.

Fahrianthi, W. Hendriani and G. Septarini, 2016. Development of critical thinking test with approach to item response theory. Journal of Educational Research and Evaluation, 21(1): 45-55.

Ikhwan, K., W., 2015. Implementation of content standards, process standards, and graduates' competency standards as quality standards of education for public MTs in Tulungagung Regency. Journal Pedagogy, 4(1): 16-22.

Ismaimuza, 2010. Effect of problem based learning with cognitive conflict strategies on mathematical critical thinking ability and attitudes of middle school students. Journal of Mathematics Education, 4(1): 1-9.

Karamustafaoğlu, S., 2011. Improving the science process skills ability of prospective science teachers using i diagrams. Eurasian Journal of Physics and Chemistry Education, 3(1): 26-38.

Kurniati, D., R. Harimukti and Jamil, 2016. Jember district's high level thinking ability in resolving PISA standard questions. Journal of Educational Research and Evaluation, 20(2): 142-155.

Mahmuzah, Ikhsan and Yusrizal, 2014. Increasing critical thinking ability and mathematical disposition of middle school students by using problem posing approach. Journal of Mathematical Didactics, 1(2): 43-53.

Ozgelen, S., 2012. Students' science process skills within a cognitive domain framework. Eurasia Journal of Mathematics, Science & Technology Education, 8(4): 283-292.

Pamungkas, Z., S., N. Aminah, S. and F. Nurosyid, 2018. Analysis of students critical thinking ability in solving scientific literacy based on metacognition ability. Edusains, 10(2): 82-93.

Sugiyono and Wibowo, 2002. Research statistics and its application with SPSS 10.0 for windows. Bandung: Alfabeta.

Sukarno, A.P. and I. Hamidah, 2013. The profile of science process skill (sps) student at secondary high school (case study in jambi). International Journal of Scientific Engineering and Research, 1(1): 79-83.

Sukarno, A.P. and I. Hamidah, 2013. The profile of science process skill (sps) student at secondary high school (case study in jambi). International Journal of Scientific Engineering and Research, 1(1): 79-83.

Suranto, 2015. Effect of motivation, ambience of the environment and learning infrastructure on student learning achievement. Journal of Social Sciences Education, 25(2): 11-19.

Suratno and D. Kurniati, 2017. Implementation of the performance assessment math-science learning model to improve students' critical thinking abilities in the jember coffee plantation area. Journal of Educational Research and Evaluation, 21(1): 1-10.

Utami, B., S. Saputro, A. Ashadi, M. Masykuri and S. Widoretno, 2016. Critical thinking ability profile of high school students in learning chemistry. International Journal of Science and Applied Science, 1(2): 124-130.

Uyanto, 2006. Guidelines for data analysis with SPSS. Yogyakarta: Graha Ilmu.

Widayanto, 2009. Development of process skills and understanding of class X students through optical kits. Indonesian Journal of Physical Education, 5(1): 1-7.

Zetriuslita, H., R. Ariawan and H. Nufus, 2016. Students' critical thinking ability: Description based on academic level and gender. Journal of Education and Practice, 7(12): 154-164.