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ANALYSIS OF HIGH SCHOOL STUDENTS CRITICAL THINKING ABILITY TO SOLVE SOCIAL SCIENCE PROBLEMS

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Abstract

Teaching physics as one domain subject in school sometimes got less attention on how to measure the critical thinking ability which is a fundamental case to elevate and reach high order thinking. This study was aimed to analyze the critical thinking ability of high school students in the Jember

district to break down the social science cases. The method used to analyze the data was descriptive qualitative which took in writing test technique. Based on the data analysis, the result showed that the critical thinking ability was able to solve social science cases only in the medium category. Thus, it could be concluded that students who were less in critical thinking ability were needed to be elevated to break down the case about social science problems through a proper teaching and learning process.

Keywords

Ability, Critical, Science, Social, Thinking

1. Introduction

Currently, globalization has led to competition in various fields of life including education, especially for science education. A necessity to improve the quality of education must be done through improving the quality of human resources (HR). An important agenda and vital issue in modern education for the 21st century is critical thinking since it is one of the innovation skills needed to prepare students to be able to compete in the job market.

The educational quality in Indonesia is currently experiencing a decline. Following Utomo's opinion *et al*., (2020), the recent trend indicates a decline, especially in science subjects indicated by the International Mathematics and Science Study (TIMSS) assessment program in 2011, which reported that students' science learning achievement was ranked 40th out of 42 participating countries. The cognitive domains aspect which includes knowing, applying, and reasoning reached 406 from the 500 scales (Martin *et al*., 2011). This shows that the ability of the reasoning domain is still relatively low, exactly 45.7% of students committed errors in reading, gave wrong answers (Utomo *et al*., 2020).

This fact is supported by the results of interviews with some science teachers in several schools in the Jember district. They stated that the weaknesses included a lack of critical thinking and a lack of empathy. During the learning process, students tended to be passive and did not have even the initiative to ask questions. The Students also had difficulties making decisions, therefore they cannot decide on an action for the existing problems. Based on the results of the TIMSS study and interviews, it might be seen that students in Indonesia needed more effort to reach the international average. It could be done by providing critical thinking skills.

Critical thinking does not only describe the ability to valuable thinking, on the path to the rules of logic and probability but also the ability to face problems in real life (Karakoc, 2016). Several efforts have been made to improve students' critical thinking including by applying appropriate learning methods (Mujib, 2016), the use of learning media (Falah *et al*., 2016), the use of learning strategies (Velina *et al*., 2017). However, some of these efforts are still not optimal. One of the causes of students' low critical thinking is the application of a teacher-centred learning model (Hapsari *et al*., 2018), therefore it is necessary to apply a student-centred learning model, as one of which is a problem-solving model.

Various previous studies have examined the effectiveness of the application in problem-solving learning models. One of them was carried out by Herzon *et al*., (2018) which stated that the problem-solving learning model was proven to elevate students' critical thinking skills. Abdurrozak & Jayadinata (2016) argued the problem-solving learning model emphasized and handed students problems through independent investigations of critical thinking skills so that the solutions are formed as important knowledge and concepts from learning. Meanwhile, Nafiah & Suyanto (2014) stated that the application of problem-solving models could overcome real problems that emphasize the use of communication, cooperation, formulating ideas, and developing reasoning. A learning model that can improve critical thinking skills is problem-solving (Nasution *et al*., 2016).

The problem-solving learning model modified with the social science approach is widely applied, for example by Wilsa *et al*., (2017) which stated, the socio-scientific approach is a model that uses social life problems conceptually related to science which aims to stimulate intellectual development, ethics, and morals as well as an awareness of the relationship between science and social life. This approach also encourages the involvement of students' minds to solve problems, thereby fostering motivation to play an active role in learning (Sri, 2015). Several previous studies have not carried out further model implementation. A study discussing the critical thinking ability of high school students to solve social science problems is rarely done. This combination is expected to make students active, think to make decisions, and be able to decide action on the problems they face. Based on these reasons, the purpose of this study is to analyze students' critical thinking skills in solving social science problems.

2. Literature Review

Critical thinking skills are skills that can be learned and can be developed. Critical thinking skills will not be able to develop well without any conscious effort to develop them during learning. As a skill or skill, critical thinking cannot be acquired in time short without practice or habituation. Critical thinking is one of the higher-order of thinking skills that must be instilled in students' thinking.

Problem-solving ability is important to be developed in students during the learning process because it relates to how students deal with problems that occur, so teachers need to know students' problem-solving abilities. Teachers can practice problem-solving if it is known that there are students who lack problem-solving skills, especially social science problems

2.1. Critical Thinking Ability

Critical thinking is a process to conceptualize, analyze, synthesize, evaluate information from observation, experience, reflection, reasoning, or communication to guide beliefs and actions (Scriven & Paul, 2012:61). Ennis (2011:23) stated, think rationally and reflectively by emphasizing making decisions about what to do. Meanwhile, Muhfahroyin (2010:52) stated a process that involves mental such as deduction-induction, classification, evaluation, and reasoning. Based on some of these opinions, it can be formulated that critical thinking is a mental process to analyze or evaluate information obtained from observations, experiences, or communication.

Anderson and Krathwohl (2015) argued that the level of student knowledge is also classified into several levels of knowledge (cognitive), the classification of cognitive domains and high order thinking is divided into six categories, from the simplest to the more complex. Critical thinking skills are included in the C-5 cognitive level, called evaluating (evaluating).

2.2. Social Science Problems

Teachers must be innovative to elevate learning models following the demands of the applicable curriculum and have adequate knowledge of science material that refers to social considerations contained in these issues. In addition, teachers need to be aware that in applying the learning model there must be uncertainty and there is a need for awareness about the existence of the teacher not the only authority holder in learning activities in the classroom.

Problems that are often encountered on daily basis will help students access information and knowledge relevant to problem-solving skills, critical thinking skills, and scientific literacy skills. Some aspects that exist in society are related to science hereinafter referred to as social science.

Sadler *et al*., (2011) stated, social science is used to explore students' understanding of research results that support the need to use social issues in society as a learning context.

The UNESCO Declaration in 2010 stated that education should be directed at 1) holistic and cross-disciplinary learning; 2) values-based learning and critical thinking; and 3) learning must involve decision making (Christenson *et al*., 2014). In line with this, learning science must be able to connect the concept of science (scientific) with social issues that develop in society. Introducing and discussing social science issues in science learning, namely making social-science issues the main content of learning materials.

3. Research Methods

The study method used in this research is a descriptive quantitative method with data collection techniques through choice test questions double to students of class XII IPA at the high school level in the Jember district who took physics subjects in the even semester 2020/2021 academic year.

The study was conducted at five high schools in the Jember district, MAN 1 Jember (70 students), MAN 2 Jember (72 students), SMAN 1 Jember (76 students), SMAN 2 Jember (66 students) and SMAN 4 Jember (72 students).

3.1. Research Time and Place

The research was carried out on February 20, 2021, until March 20, 2021, in five high schools in the Jember Regency for the 2020/2021 academic year. The research area was determined using the purposive sampling area method, according to Yusuf (2017)'s opinion that the selection of the research area was based on certain goals or considerations.

3.2. Population dan Sample

The research population was high school students in the Jember district. Sampling was done using the random sampling technique. The samples obtained were students of class XII IPA in five high schools taken in each of 2 classes.

3.3. Research Procedure

The study was conducted to analyze students' critical thinking skills in solving social science problems using five syntaxes or stages, namely 1) orientation to social science problems, 2) organizing students, 3) guiding students, 4) developing and producing works, 5) analyzing and

evaluating the problem-solving process. In detail the stages of learning are presented in table 1 as follows:

Table 1: *Social Science Problem Solving Syntax*

Syntax	Description
Phase 1 Orientation to social science problems	Students are directed to find sources with social science topics, then analyze the facts in the problem
Phase 2 Organizing students	Researchers set sufficient time for discussion and investigation
Phase 3 Guiding students	Students investigate the results of studies on social science, explain and provide solutions to existing problems
Phase 4 Develop and produce works	Researchers help students to plan and prepare their work in solving problems that occur
Phase 5 Analyze and evaluate the problem-solving process	Researchers help students reflect or evaluate the critical thinking processes they use in making decisions about solutions to problems that occur

(Source: Utomo et al., 2020)

3.4. Data, Instruments, and Data Collection Techniques

The data collection technique used in the study was a written test with indicators of critical thinking skills, namely providing basic explanations, basic skills, concluding further explanations, strategies, and tactics, interviews, observations, and documentation. Observation techniques were used to observe the implementation of the learning process plans carried out. The instrument for collecting data on the ability to think critically was obtained from students' scores in working on written test questions. The research instrument was analyzed by a validator.

3.5. Data Analysis Techniques

The results of the written test data were scored which was then continued by calculating the achievement results of the ability to solve social science problems with the formula:

$$P = \frac{N}{M}\ x\ 100\% \quad (1)$$

P = value obtained
N = scored obtained
M = maximum scored

The next step was to calculate the average percentage of each school with the following formula:

$$Average\ value = \frac{Total\ skor}{Total\ students}\ x\ 100\% \quad (2)$$

The average percentage result was then converted using a scale of 5 which is shown in table 2 as follows:

Table 2: *The Percentage Category Of High School Students' Critical Thinking Skills To Solve Social Science Problems*

No	Interval	Category
1.	86% – 100%	Very good
2.	76% – 85%	Good
3.	60% – 75%	Medium
4.	55% – 59%	Low
5.	< 54	Very low

(Source: Modification Purwanto, 2013)

4. Results and Discussion

The average critical thinking ability to solve social science problems for high school students showed varying results. In addition, after calculating the total item items, an average of 53.65%. The scores obtained by each school sequentially, namely 53.14% (very low) MAN 1 Jember; 50.07% (very low) MAN 2 Jember; 56.35% (low) SMAN 1 Jember; 54.77% (very low) SMAN 2 Jember; and 53.96% (very low) SMAN 4 Jember.

Table 3: *The Results Of Tests Of Critical Thinking Skills To Solve Social Science Problems*

No	School Name	Total Respondents	Percentage Average Value	Category
1.	MAN 1 Jember	70	53.14%	Very low
2.	MAN 2 Jember	72	50.07%	Very low
3.	SMAN 1 Jember	76	56.32%	Low
4.	SMAN 2 Jember	66	54.77%	Very low
5.	SMAN 4 Jember	72	53.96%	Very low
	Total Average		**53.65%**	**Very law**

(Source: Authors Own Illustrations)

Based on the test results after being consulted with the percentage category table, various values were obtained. The highest category is SMAN 1 Jember, which is 56.32% and the lowest is a MAN 2 Jember, which is 50.07%.

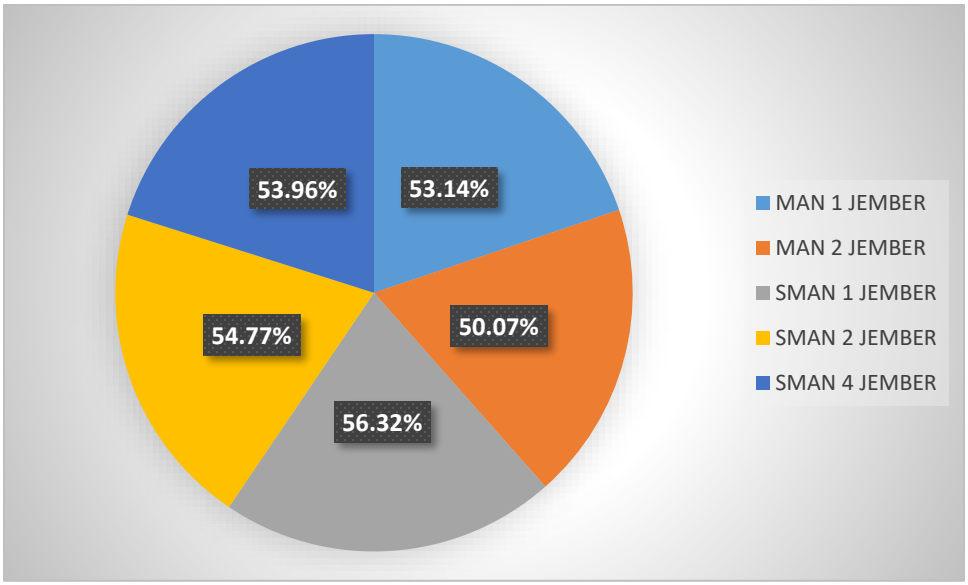

Figure 1: *Percentage Of High School Students' Critical Thinking Skills To Solve Social Science Problems*
(Source: Authors Own Illustrations)

The critical thinking ability that overcomes this research was social science problem-solving. The results of the research on the critical thinking skills of high school students in Jember Regency to solve social science problems were classified as very law as evidenced by the average percentage of 53.65%. These results indicated that the ability to think critically needed to be improved, especially at MAN 2 Jember which obtained results in the very low category. Prihatiningsih *et al*., (2016) in their research stated that students' critical thinking skills were still underdeveloped or still low. The low critical thinking ability of these students is partly because the learning applied in schools is still dominated by teachers so that they do not train students' critical thinking skills. Patonahs' research (2014) stated that science learning is still dominated by teachers, learning tends to memorize rather than develop thinking power so that students are weak in conveying their ideas, weak in analyzing, and others who are responsible for their own choices.

Low critical thinking skills could hurt students. Thus, the student should have critical thinking skills to solve social problems need so that they are familiar with the challenges faced in learning science. Yuliati (2013) stated, Critical thinking can be taught and it requires practice. Critical thinking skills determine students' choices because critical thinking allows students to analyze their minds in determining and drawing conclusions intelligently. If students are allowed

to use their thinking, they will get used to distinguishing between truth and facts, appearance and reality, facts and opinions, knowledge and beliefs (Kurniawati *et al*., 2014).

Every teacher must be able to create learning that trains students' critical thinking skills. The selection of the right learning model could increase all the potential of students which in turn can improve students' critical thinking skills. The results of Susilo (2012)'s research showed that there is an increase in students' critical thinking skills after students learn through problem-based learning. In addition, the problem-based model can also increase students' learning motivation.

Socio-scientific issues can serve as a good learning context that allows students to understand the importance of knowledge in everyday life and shape students' awareness to become consumers of scientific information (Evagorou *et al*., 2012). Farisi & Hamid (2017) stated that the application of the problem-based learning model was able to develop social skills through group discussion and collaboration, so that students were trained to respect friends, and were able to train students in speaking through presentations of group work. Meanwhile, Gutierez's research (2015) stated, integrating socio-scientific issues can be the right approach to improve students' bioethical decision-making so that the strategy and tactics indicators of students have increased from the previous pretest scores.

The results of research by Wilsa *et al*., (2017) stated that learning using a problem-based learning model based on socio-scientific issues can produce students' critical thinking skills that develop well, and research by Anjar *et al*., (2020) stated, the application of a socio-scientific-based problem-based learning model issue has a significant effect on students' critical thinking skills, the average value of students' critical thinking skills in the experimental class is greater than the control class. The data is also supported by the results of the test using the independent sample t-test with a significance value of 0.023 (0.023 < 0.05), which indicates that there is a difference in the average value of critical thinking skills between the experimental class and the control class so that the application of the problem-based learning model learning based on socio-scientific issue affects students' critical thinking skills. Another research conducted by Nugraha *et al*., (2017) stated, presenting socio-scientific issues can improve students' critical thinking skills, especially on indicators of providing simple explanations because students can solve problems given based on information that has been obtained or has been known.

Based on the research by Pintaka *et al*., (2020) conducted in group XI MIPA SMAN 13 Samarinda, from the statistical analysis of the use of the t-test (t-count, 3.153 > t-table, 1.66) it can

be said that there is an effect of using the issue of socio-scientific in the discovery learning model on students' critical thinking skills on the subject of acid and base. These results are following research conducted by Lathifah and Susilo (2015) which stated that a socio-scientific issue-based learning approach can improve critical thinking skills. The results of this study indicate that the socio-scientific issue-based learning approach plays a role in improving students' critical thinking skills.

5. Conclusion

Based on data analysis, the key is that the critical thinking skills of high school students in Jember Regency to solve social science problems have been categorized as very law. These results can be seen from the acquisition of an average percentage of 53.65%. Of the five samples of SMA in the Jember district, that achieved the highest level of critical thinking skills to solve social science problems is SMA Negeri 1 Jember.

Thus, based on data analysis, the key is that the critical thinking skills of high school students in Jember Regency to solve social science problems have been categorized as very law. These results can be seen from the acquisition of an average percentage of 53.65%. Of the five samples of SMA in the Jember Regency who achieved the highest level of critical thinking ability to solve social science problems is SMA Negeri 1 Jember was in a low category, while the other four got the percentage in the very low.

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