Research Article

Analysis of the Critical Thinking Initial Ability about Static Fluid Material in Class XI of SMA Negeri 7 Surakarta

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ABSTRACT

This research aims to describe the initial ability of critical thinking, of high school students in Surakarta on static fluid. This study is part of the learning tools development study to improve critical thinking ability. The critical thinking skills test is compiled into ten questions. The analyzed critical thinking skills are students' critical thinking abilities before a model is applied that is expected to develop a student's critical thinking skills. This research includes descriptive research. The subjects of this study were 35 students of Class XI in SMA Negeri 7 Surakarta. The data collection methods used are test methods. Data analysis techniques use quantitative descriptive analysis. The results showed that the achievement of critical thinking in the analysis aspect with sub-skills of detecting arguments and analyzing arguments was 41,75%. The inference aspect with sub-skills of making a logical conclusion was 29,25%. The interpretation aspect with sub-skills of classifying the meaning was 44,1 %. The explanation aspect with sub-skills of stating results, justifying procedures, and presenting arguments was 57,7%. And the evaluation aspect with sub-skills of assess the credibility and assess the quality of arguments was 24,65%. These results show that students' critical thinking skills are still low, especially in evaluation aspects.

Keywords: Development studies, Critical thinking

Introduction

In the development of 21st-century skills, students in learning require students to have 4C skills, one of which is critical thinking skills. Critical thinking skills are a directional and clear process that is used in mental activities such as solving problems, making decisions, persuading, analyzing assumptions, and

conducting scientific research. Critical thinking is the ability to argue in an organized way. One cannot study well without thinking well. Critical thinking is related to career success, but also to succeed in higher education. The root causes of failure of Indonesian students every 3 years or 4 years in the context of TIMSS and PISA or equal distribution of education for

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educators, access to education, and limited learning facilities. Indonesia still needs time and strong enthusiasm to continue to fight on a better level. To achieve a better ranking, it is necessary to improve the quality of education through 21st century learning with the latest models that greatly contribute to improving the quality of education in Indonesia.

One of the efforts to improve the quality of education is to carry out various innovations in the curriculum so that it will be able to bring out the critical thinking skills of each individual, especially students [1]. This is supported by the opinion of Liliyasi [2] which states that "the ability to think which is the basis of other thinking skills is the ability to think critically". The ability to think critically affects the formation of students' scientific attitudes [3] Critical thinking is a reflective decision-making discretion in problem-solving about what to believe and do the process of intellectual, discipline actively, skillfully conceptualizing, applying, analyzing, synthesizing, and evaluating information gathered from observation, experience, reflection, reasoning, or communication as a guide to belief and action [4]. Thus the free critical thinking can be defined as the ability to consider everything using the method-a method of thinking consistently as well as reflect on them as a basis to make valid conclusions. Education in Indonesia has not been able to bring even improve the critical thinking skills of learners [5].

Changes in the present are already happening everywhere. The change is the result presented by SCIENCE and technology. However, with the many changes, it brings a lot of negative impacts, namely the birth of various patterns of thought that are misleading. If dealing with a different mindset heresy, thus, the fate of the generation now really need to be made aware that technology, especially communication technologies such as mobile phones and the internet is not something that can cope with many things because these instruments are ambivalent. Should be so that the utility of technology in harmony with human values, then the required intelligence and discernment can distinguish which ones are worth intrinsic and

which ones are worth you're instrumental. About critical thinking is very urgent to be raised continuously, especially among the younger generation. Because that's in the education of critical thinking that should be placed as an integral part of the learning process from the level of basic education, secondary and above to the college.

But the fact shows a lack of critical thinking skills of learners. This is evidenced by the results of research conducted by Sirait [6] that Results research showed 56% of students can complete the physics calculations. However, students had difficulty in interpreting the data provided. From this analysis, it can be concluded that the critical thinking skills of students are still relatively low in the category of evaluation. It was found that students are only able to complete the calculation of the physics (inference) but not able to interpret the answer (evaluation). Students experience difficulties in identifying the wrong assumptions and identify data that is not given at the time of troubleshooting. This is in line with research by Atayeva [7] that of the 115 students who take the test the critical thinking skills of 86,6% of students entering in the low category.

In this study, there are six aspects of critical thinking skills developed by Facione [4] in Table 1.

Based on the introduction above, researchers are interested to research the analysis of the initial ability of critical thinking, of high school students in Surakarta city. As one of the efforts in improving the quality of education. By developing E-Module-based Interactive problem solving can improve students ' critical thinking skills in high school. The learning Model which is expected to train students in the enhancement of critical thinking skills is problem-based learning (PBL). And during this time the students ' critical thinking skills in learning are not yet fully optimal. So, it takes a lot of innovation in learning, so that students ' critical thinking skills to be optimal. After the research is completed, it is expected the teacher to be more motivated to draw up the learning process better, so that the critical thinking skills students will be able to more increased.

Table 1. Aspects - aspects of critical thinking skills

Aspect	Description	Sub Skills
<i>Analysis</i>	The skill of identifying the meaning of the truth of the conclusion in the relationship between the question and the concept, the description or the form of the question, the hope of expressing beliefs and decisions, experiences and reasons and information and opinions.	a. Examine ideas b. Detect arguments c. Analyzes arguments
<i>Inference</i>	The skills to identify and select elements are needed to form reasoned conclusions or form hypotheses by paying attention to relevant information and reducing the consequences resulting from data, questions, principles, evidence, judgments, beliefs or other forms of representation.	a. Ask for evidence b. Suppose alternatives c. Make logical conclusions
<i>Interpretation</i>	Skills to understand, express meaning, statements of varying experiences, situations and data, events and decisions, conversion of beliefs and rules, procedures or criteria.	a. Categorization b. Coding significance c. Classifies the meaning / meaning clearly
<i>Explanation</i>	Skills in stating the results of a person's consideration process justifying reasons based on the evidence, concept, methodology, certain criteria in reasonable consideration, and the ability to present reasons in the form of convincing arguments	a. Declare the results b. Justifies procedure c. Presenting arguments
<i>Self-Regulation</i>	A person's awareness monitors his or her cognition, the elements that are used in the thought process and the results that are developed, in particular applying the skills to analyze and evaluate one's ability to draw conclusions in the form of questions, confirmations, validations and corrections.	a. Self-examination b. Self-correction
<i>Evaluation</i>	Skills to assess the credibility of questions or other presentations with values or describe a person's perception, experiences, situations, decisions, beliefs and assess the logical strength of actual inferential relationships including statements, descriptions, questions or other forms of representation.	a. Assess credibility b. Assess the quality of the argument

Source: Facione [4]

Methods

This type of research is a descriptive study with a quantitative approach that aims to describe carefully and systematically the facts and characteristics of certain populations. This is used to describe the achievement of the analytical aspect with the sub-skills to detect arguments and analyze arguments, the inference aspect with the sub-skill of making logical conclusions, the interpretation aspect with the sub-skills to classify the meaning, the explanation aspect with the sub-skills of stating results and

justifying procedures and presenting arguments, and the evaluation aspect with sub-skills assessing the credibility and assessing the quality of the argument.

Descriptive research design is a research design, structured to provide a systematic description of scientific information originating from the subject or object of research. The method used in this research is a survey method. This research was conducted in the odd semester of the 2020/2021 school year at SMA Negeri 7 Surakarta. The sample in this

study were students of class XI IPA SMA Negeri 7 Surakarta. The instrument used in this study was a test sheet. The test sheet is used to determine the profile of students' critical thinking skills. Types of research Students' answers are categorized into five aspects of critical thinking skills, then a percentage according to aspects of critical thinking skills. The data analysis technique used in this research is quantitative descriptive analysis. This quantitative descriptive analysis technique is used to process data obtained from the test in the descriptive form of the percentage of critical thinking skills.

Data collection in this study used a preliminary ability test. This test uses Static Fluid material which is prerequisite material for studying Temperature and Heat material. The research instrument used was 10 descriptive questions. In preparing the critical thinking test, the researcher was guided by the aspects of Facione's critical thinking ability, and some of it was adapted from Dwie Pratiwi's research. Students' initial critical thinking abilities were analyzed by the criteria listed in Table 2.

Table 2. Criteria for the average ability of students' initial critical thinking in percentage

86 % – 100 %	Very high
71 % – 85 %	High
56 % – 70 %	Medium
41 % – 55 %	Low
< 40 %	Very low

(Adaptation Wahyu et al., [8])

This type of research is a descriptive study with a quantitative approach that aims to describe carefully and systematically the facts and characteristics of certain populations. This is used to describe the achievement of the analytical aspect with the sub-skills to detect arguments and analyze arguments, the inference aspect.

Results and Discussion

This section will present the results of the The initial ability of students to think critically is the ability that students have before the learning process takes place. The initial ability of students to think critically in this study was based on the average score of students' test scores on static fluid material, but categorized based on the aspects of critical thinking skills can be seen in Table 3.

Table 3. Students' initial critical thinking abilities in each aspect

No	Aspect	Sub skills	Question number	Average score	Percentage	Total
1	Analysis	a. Detect arguments	1	1,71	42,75 %	41,75 %
		b. Analyze arguments	2	1,63	40,75 %	
2	Inference	a. Make logical conclusions	8	3,51	29,25 %	29,25 %
3	Interpretation	a. Classify the meaning / meaning clearly	6,7	4,41	44,1 %	44,1 %
4	Explanation	a. Declare the results	3	3,21	40,12 %	57,7 %
		b. Justifies procedure	4	7,86	65,5 %	
		c. Presenting arguments	5	5,4	67,5 %	
5	Evaluation	a. Assess credibility	9	3,43	17,15 %	24,65 %
		b. Assess the quality of the argument	10	3,86	32,16 %	

There are 5 categories of students' critical thinking measured in this study, namely category A (analysis), category B (inference), category C (interpretation), category D

(explanation), category E (evaluation). The results of the achievement of students' initial critical thinking abilities in each category can be seen in Figure 1.

Figure 1. Achievement of students' critical thinking skills in each category

Based on table 3, the average critical thinking ability of students is 39.49% or is in the very low category. The average is obtained from the results of the students' initial critical thinking abilities which are categorized in each aspect. In the analysis aspect, the sub-skills to detect arguments and analyze arguments are 41.75% or in the lowest category. The inference aspect with the sub-skills of making logical conclusions is 29.25% or it is in the very low category. The interpretation aspect with the sub-skills of classifying meaning is 44.1% or it is in a low category. The explanation aspect with sub-skills stated the results, justified the procedure, and presented arguments was 57.7% or in the medium category. And the evaluation aspect with sub-skills assessing credibility and assessing the

quality of the argument is 24.65% or is in the very low category.

Aspects of the analysis

Aspects of the analysis are the skills students use in their learning outcomes to be able to identify the thing intended. As well as connect the actual relationship inferential between statements, questions, concepts, descriptions, or other forms of representation intended to be expressed by beliefs, judgments, reasons, information, or opinions of the students. The aspect of this analysis is focused on two sub-skills, namely the detect the argument to question No. 1 and analyze the arguments for question No. 2. The distribution aspect of the analysis of the students shown in Figure 2.

Figure 2. The distribution of aspect analysis

Figure 2, distribution aspects of the analysis of the students based on the picture above indicate that the percentage of students' critical thinking skills in aspects of the analysis with the sub-skills of detecting arguments and analyzing the argument is 47,14% in the category of very low, 35,71% in the low category, 15,71% in the good category, and 1,42% in the very good category. The answers of students show that many students are not able to connect the concepts used to answer the question. Just the same with the students who explained their answers are not complete about the hydrostatic pressure and capillarity. Therefore, teachers should be more sought in improving the identification skills of the students, connect concepts and express them. Students who are not too active at the time of learning will make them more difficult to be

analyzed. So the solution the students need to be more familiarized with working problems that are more factual or in everyday life so that the analysis capability of the students can be more increased.

Aspects of inference

Aspects of inference are a student's skill in the exciting conclusion in learning to be able to identify and secure elements needed in drawing conclusions that make sense, to form conjectures and hypotheses, and consider relevant information to develop consequences from data, statements, principles, and evidence. On the aspect of inference is more focused on sub-skills that make a logical conclusion to question No. 8. The distribution aspect of the inference of the student is shown in Figure 3.

Figure 3. The distribution of aspect inference

Figure 3, the distribution aspect of the inference the student based on the picture above indicates that the percentage of students' critical thinking skills in the aspect of inference with a sub-skill of making the logical conclusion is 20% in the category of very low, 80% in the low category, 0% in the good category, and 0% in the very good category. The students' answers showed that many students still can not collect the information contained in the questions and students have not been accustomed to developing a series of opinions and information and make conclusions. Therefore, the teacher should familiarize the students in constructing the meaning of an element readings

so that students can predict what will happen next to what is known about formulating a coherent synthesis of ideas.

Aspects of Interpretation

The aspect of interpretation is the skill of students in understanding and expressing the meaning or significance of a wide variety of experiences, situations, data, procedures, or criteria. The aspect of inference is more focused on sub-skills, namely classifying meaning to question No.6 and No. 7. The distribution aspect of the interpretation of the students is shown in Figure 4.

Figure 4. The distribution of aspect interpretation

Figure 4, the distribution aspects of the interpretation of the students based on the picture above indicates that the percentage of students' critical thinking skills in the aspect of interpretation with the sub-skills classifying the meaning is off 7.14% in the category of very low, 85.71% in the low category, of 5.71% in the good category, and 1.42% in the very good category. From the students' answers is still a lot of shows the difficulty in analyzing and evaluating correctly, which means they need to increase the skills of students in performing the categorization. The problem most of the students are students not able to define based on the questions given as well as the lack of interest of students in problem-solving. Students also could not explain ideas in their own words.

Aspects explanation

Aspects explanation is a skill the students in the present by convincing with how coherent the results of the reasoning of a person. This means it can give a person the see fully the big picture to state and to justify that reason in terms of evidence, conceptual, methodological, and contextual which became the basis of the results of someone. On the aspect of explanation is more focused on sub-skills, namely stating results, justifying procedures, and presenting arguments to question No. 3, No. 4, and No.5. The distribution of aspect explanation students is shown in Figure 5.

Figure 5. The distribution of aspect explanation

Figure 5, the distribution of aspects of the explanation the students based on the picture above indicates that the percentage of students 'critical thinking skills in the aspect of the explanation to sub-skills of stating results, justifying procedures, and presenting the argument is 19.04% in the category of very low -, 31,42% in the low category, 17,14% in the good category, and 32,38% in the very good category. The students' answers show that half of the students who can already stated the answers very well and justify procedures and present arguments well on question No. 3, 4, and 5. Most of the students already good at explaining in full. The students have already explained conceptually

and the result is a maximum even though half of it is still not the maximum.

Aspects of evaluation

The aspect of evaluation is the skill of students in evaluating the learning can assess the credibility of statements or other representations by comparing the advantages and disadvantages of the alternative interpretations as well as determine the credibility of source information by judging if two statements contradict each other. The aspect of this evaluation is focused on sub-skills that assess the credibility and assess the quality of the argument to question No. 9 and No.10. The distribution aspect of student evaluation is shown in Figure 6.

Figure 6. The distribution of aspect evaluation

Figure 6 distribution aspects of the evaluation of students based on the picture above indicate that the percentage of students' critical thinking skills in the aspects of the evaluation with sub-skills assessing credibility and assessing the quality of arguments is 55,71% in the category of very low -, 40,00% in the low category, to 4.28% in the good category, and 0% in the very good category. From the students' answers still, many of them are not able to complete the question correctly and this means that almost all the students are categorized as very low in assessing the credibility and assess the quality of the argument. The teacher should give guidance to the students to be able to interpret facts and logic in the discovery of new objective information. As well as the

teacher should familiarize the students in recognizing the factors that make a person become more credible about an event or related to assessing the conclusion of the argument already followed properly or not.

The low initial ability students' critical thinking makes researchers assume that students have not been accustomed to getting questions with cognitive levels that are categorized by each aspect of the ability to think critically on the material of the static Fluid. It is still very reasonable, so the need to do better coaching to improve students' critical thinking skills, especially in the aspect of evaluation with sub-skills assessing credibility and assessing the quality of arguments is in the category of very low.

The early ability to think critically is very important. According to Winkel in Wahyono [9], the ability of beginning is described as the bridge to ability the final. So it can be assumed that the initial ability is not a thing that can be seen next to the wire. The initial ability of the students will bring the students towards the ability next. This is following the opinion of Razak [10] which states that the ability of a good start will have the ability to think critically as well.

Conclusion

From the results of the research and data analysis can be concluded that the critical thinking skills of students of SMA Negeri 7 Surakarta in the subject of physics, especially the material of the static fluid that is 39,49% with category very low. The percentage of aspects of the analysis of 41,75% category low, aspects of inference 29,25% categorized very low, aspects of the interpretation of the 44.1% are categorized low, aspect of the explanation of 57.7% uncategorized being and aspects of the evaluation of 24,65% categorized very low. This is following the research of Ryan Priyadi (2018) that the critical thinking skills of students are still relatively very low, especially in the category of evaluation. It was found that students are only able to present the argument (explanation) but are not able to assess the quality of the argument (evaluation).

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