

Correlation between Science Process Skills and Critical Thinking Skills in Jambi City Junior High School

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Abstract

Teachers need to know how science process skills and students' critical thinking skills are. This study aims to see the relationship between science process skills and critical thinking skills so that teachers can determine the appropriate learning methods to improve science process skills and critical thinking skills. The researcher employed a sample of 58 students from class IX junior high school Adhyaksa 1 Jambi City. The sampling technique in this study using cluster sampling. This study's research design is an associative quantitative research method with a correlational research design. Quantitative analysis uses the SPSS program to find descriptive, normality tests, linearity tests, and correlation tests. The results showed that the significance value obtained was less than 0.05. It was seen that there was a relationship between students' process skills and students' critical thinking abilities

Keywords: science process skills; critical thinking skills; correlation

Hubungan Keterampilan Proses Sains dengan Keterampilan Berpikir Kritis di SMP Kota Jambi

Abstrak

Sangat penting bagi guru untuk mengetahui bagaimana keterampilan proses sains dan kemampuan berpikir kritis siswa. Penelitian ini bertujuan untuk melihat hubungan antara keterampilan proses sains dan kemampuan berpikir kritis sehingga guru bisa menentukan metode pembelajaran yang tepat untuk meningkatkan keterampilan proses sains dan kemampuan berpikir kritis. Sampel yang digunakan peneliti adalah siswa kelas IX SMP Adhyaksa 1 Kota Jambi yang berjumlah 58 siswa. Teknik pengambilan sampel dalam penelitian ini menggunakan cluster sampling. Desain penelitian yang digunakan dalam penelitian ini adalah metode penelitian kuantitatif asosiatif dengan desain penelitian korelasional. Analisis kuantitatif menggunakan program SPSS untuk mencari deskriptif, uji normalitas, uji linieritas dan uji korelasi. Hasil penelitian menunjukkan bahwa nilai signifikansi yang diperoleh lebih kecil dari 0,05 hal ini terlihat bahwa terdapat hubungan antara keterampilan proses siswa dengan kemampuan berpikir kritis siswa

Kata Kunci: *keterampilan proses sains; keterampilan berpikir kritis; korelasi*

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I. INTRODUCTION

Education is an activity carried out by someone to gain knowledge, skills, and habits in life [1][2]. Essential activities in the learning process are parts of education [3]. Education in Indonesia has progressed well and still needs more development to be better [4]. Informal education, science is an important study. Science is mastery of a collection of knowledge in the form of facts, concepts, or principles and is a process of discovery [5]. Natural Sciences consist of several fields of learning, one of which is Physics.

Physics is one branch of natural science that is fundamental for students to understand the natural phenomena that occur around them [6][7]. The goals of teaching physics can be classified into four categories: Cognitive, metacognitive, emotional (or effective), and practical goals [8]. There are still many weaknesses to learning physics in developing the ability to reason and think inductive and deductive analysis using physics concepts and principles [9]. One of the causes is when the physics learning process is done using conventional methods students only know the concepts of physics alone without knowing how to obtain these concepts [10]. To overcome this problem in learning physics, requires the process skills and ability to think critically.

Science process skills are critical thinking abilities that assist students in learning how to solve issues and find solutions

through knowledge [11]. Science process skills have two categories: basic science and science process integration skills [12]. Process skills consist of basic skills, where these basic skills will be the basis for further skill development [13]. Basic science process skills consist of observing, classifying, predicting, measuring, inferring, and communicating [14].

Learning will be more meaningful if students are allowed to know and be actively involved in finding concepts from existing phenomena from the environment with the teacher's guidance [15]. Thus, to learn these concepts, science process skills are needed. Process skills and scientific attitudes can be developed by providing direct experience to students. One of them is through practical activities or experiments [16]. Students who do not have the science process skills, then these students are not able to obtain information and find solutions in solving problems, so this will make mastery of concepts less than the maximum. Science process skills are a medium for developing higher-order thinking skills such as critical thinking.

Critical thinking is to use cognitive skills or strategies that enhance desired learning outcomes [17]. The purpose of critical thinking has a broader view of critical thinking which is almost the same as ideal ideality [18]. Critical thinking includes basic intellectual skills, but these skills can be used to serve two different purposes: self-centered or other thoughts [19]. Critical thinking is a

process that depends on, develops a variety of skills and qualities of self [20]. Critical thinking involves more than just possessing and applying certain skills in terms of logic [21].

Good critical thinking skills are essential for students to analyze thoughts, arguments, solve problems carefully [22]. Students must have critical thinking skills in general and specific aspects in order to have effective critical thinking skills. The ability to think critically on specific aspects is that students can understand the concepts learned. In contrast, the general aspects of students can solve problems and phenomena in daily life that require a correct understanding of physical concepts [23]. The lack of students' critical thinking skills can be caused by students who lack knowledge of learning concepts and materials [24]. Misunderstanding the concept of learning can cause student learning outcomes to be below [25]. Therefore, it is crucial to know the students' critical thinking skills in every physics learning material at school.

Knowledge about static fluid material is not enough for students to learn theories or concepts, but students need a skill. Learning will be more meaningful if students are allowed to know and be actively involved in finding concepts from existing phenomena from the environment with the teacher's guidance [15]. Thus to learn these concepts, science process skills are needed. Process skills and scientific attitudes can be developed by providing direct experience to students. One of them is through practical activities or experiments [16]. Practical activities in learning physics have a motivational role in learning, provide opportunities for students to develop some skills, and improve the quality of student learning [26]. Practicum has three functions: training, giving feedback, and increasing motivation, which requires information processing skills information [27].

Teaching and learning process with this experimental method, students are allowed to experience themselves or do it themselves, follow a process, observe an object, analyze, prove and draw their conclusions about an object, situation, or process of something [28]. Practicum activities become one of the learning activities for students to develop the ability to think, analyze, solve problems, prove and draw conclusions of an object from the material being studied [29].

Based on the facts in the field research [26], it was found that SMP Negeri 4 Kragan Rembang had low-quality students in understanding the concepts of Physics Science, studying, and working on Physics Science problems, which had an impact on the achievement of Physics Science scores. The research results [30] found that the science process skills of junior high school students in Jambi on several indicators were still low.[31] also argues that in studying science, students are still theoretical and do not develop critical thinking skills.

The physics learning process requires special abilities, namely science process skills, and critical thinking skills. It is necessary to see whether the students' science process skills and critical thinking skills are low or high. Based on this description, this research aims to know the relationship between science process skills and critical thinking skills so that teachers can determine the appropriate learning methods to improve science process skills and critical thinking skills.

II. METHOD

The research design used in this study is an associative quantitative research method with a correlational research design. Associative quantitative research is research that aims to determine the relationship between two and more variables [32]. Based on [33] correlational design is a procedure in quantitative research used by researchers to

measure the degree of association (relationship) between two or more variables using the statistical analysis correlation procedure.

The sample used by researchers was grade IX students of Adhyaksa 1 Junior High School, Jambi City, totaling 58 students. The sampling technique in this study uses cluster sampling. Cluster sampling (Area Sampling) is used to determine the sample if the object to be studied or the data source is very broad, for example, residents of a country, province, or district [34].

In this study, the instruments used were ten essay questions validated by experts and an observation sheet for the science process skills that expert validators had validated. The rubric assessment instrument tests rubric critical thinking skills. Rubric used has a range of sectors 0 to 4. Data on the observation sheet will be analyzed using descriptive statistics. Descriptive statistics display general trends in data to describe one variable [33]. The percentage for each indicator sought is then stated in several categories, namely the Very not good (VNG), Not Good (NG), Good (G), Very Good (VG) categories.

The data in this study used quantitative analysis data using the SPSS program to

search for descriptive, normality tests, linearity tests, and correlation tests. Descriptive statistics are descriptions or presentations of large amounts of data, in this case, in the form of summary frequencies, for example, modes, mean, median, minimum, maximum, and standard deviations, and statistical inference using product-moment correlations [32].

Table 1. Intervals of Critical Thinking Skills

No	Interval	Category
1	10.00 - 17.50	Very not good
2	17.51 - 25.00	Not good
3	25.01 - 32.50	Good
4	32.51 - 40.00	Very good

Table 2. Categories of Student Science Process Skill

Interval	Category
46.00 - 80.50	Very not good
80.51 - 115.00	Not good
115.01 - 149.50	Good
149.51 - 184.00	Very good

III. RESULTS AND DISCUSSION

The analysis of the mastery of science skills and critical thinking skills of students with static fluid material can be seen in table 3 and Table 4.

Table 3. Results of Students' Science Process Skills

Nu	Interval	Category	Mean	Median	Min	Max	%	f
1	46.00 - 80.50	VNG					41.4	24
2	80.51 - 115.00	NG	105.4	87.5	66	178.	19.0	11
3	115.01 - 149.50	G					20.7	12
4	149.51 - 184.00	VG					19.0	11

Table 3, which comes from 58 respondents from junior high school Adhyaksa 1, Jambi city, shows that students' science process skills are categorized as not good. Of the 58 respondents, the results were

processed using the SPSS application. It was obtained that the science process skills of students who were categorized as very bad had the highest percentage of 24 people with a percentage of 41.4 %.

Table 4. Results of Students' Critical Thinking Skills

Nu	Interval	Category	Mean	Median	Min	Max	%	f
1	10.00 - 17.50	VNG					36.2	21
2	17.51 - 25.00	NG	22.25	22	10	40	22.4	13
3	25.01 – 32.50	G					24.1	14
4	32.51 – 40.00	VG					17.2	10

Table 4, which comes from 58 respondents from junior high school Adhyaksa 1, Jambi city, shows that students' critical thinking skills are categorized as not good. From 58 respondents, the results were processed using the SPSS application, and it was found that students' critical thinking skills were categorized as very low and had the highest percentage of 21 people with a rate of 36.2 %.

Furthermore, the data were analyzed to know the relationship between two variables: the relationship between science process skills and students' critical thinking skills using the Pearson correlation test. According to Sinaga, et al. a normality test is used to determine whether the sample comes from a population that is normally distributed or not [35]. There are several techniques used to test data

normality, namely the Kolmogorov-Smirnov test. The linearity test is used to assess whether the specifications of the model used are correct or not (Enterprise, 2014). Based on the normality test results, it is known that the significance value is $0.274 > 0.05$. It can be concluded that the residual value is normally distributed. Based on the results of the linearity test, the significance value of deviation from linearity is known to be 0.26, meaning > 0.05 . It can be concluded that there is a linear relationship between science process skills and critical thinking abilities. From the results of the normality and linearity test, it is known that the data is homogeneous and linear. The Pearson correlation test will be performed to see the relationship between science process skills and critical thinking skills.

Table 5. Relationship Between Process Skills and Students' Critical Thinking Skills

Variable	SPS		CTS	
	r	Sig. (2-tailed)	r	Sig. (2-tailed)
SPS	1		0.317	0.015
CTS	0.317	0.015	1	

From Table 5. We can see the significant value obtained by 0.015 smaller than 0.05, it appears that there is a relationship between science process skills with the ability to think critically students on the value of person correlation 0.317 means that there is a weak correlation between science process skills with students' critical thinking skills. If the value of sig. < 0.05 , then there is a relationship [37].

Science process skills are one of the important process skills students have [38].

Process skills are acquired skills and basic skills. Where these basic skills will develop higher skills. Students can use science process skills to solve physical problems in daily life [39]. Description of the science process skills of junior high school students on static fluid material is presented in Table 3. Table 3 shows the process skills of junior high school students are relatively low because the highest percentage of 41.4 %, is in a very bad category. Researchers also conducted interviews with two students to see students' science process

skills. From the interview results, it can be seen that, through the activities of the curriculum, it can be seen that the science process skills of Adhyaksa 1 Junior High School students in Jambi City are not good. Because in general, teaching and learning activities that occur during this are still traditional and rarely carry out practical activities. Students do not explore the science process skills and the low quality of students in understanding concepts. Skill in the process of science and critical thinking ability is closely related because students who do not have the ability of the science process then the student's thinking will not be critical.

Critical thinking is to use cognitive skills or strategies that enhance desired learning outcomes [17]. The purpose of critical thinking has a broader view of critical thinking which is almost the same as ideal ideality [18]. The findings of the analysis of students' critical thinking abilities are known, and students' critical thinking abilities are categorized as very low, with students obtaining the maximum percentage of 36.2 percent in the very low group. According to observations and discussions with teachers and students, kids' critical thinking skills remain low. Because students are more likely to observe rather than participate during practicum. Students also do not provide an optimal response to the problems raised by the teacher so that students' critical thinking skills are low. The high and low ability of students' critical thinking is certainly some factors. One of the causes is the lack of understanding of the concept and misconception of static fluid material.

The results of the Pearson correlation analysis that have been carried out show that there is a weak correlation between science process skills and students' critical thinking skills. The weak correlation occurs because most students both have low science process skills and critical thinking skills. Students

who have low processing skills will tend to have low critical thinking abilities. In the indicator of science process skills, there are indicators of the ability to think critically. If students master science process skills, students also have critical thinking. This is the same, except that according to the findings of the research [40], science process skills appear to strongly associate with critical thinking, and children with low science process skills have moderate or low critical thinking skills.

Students who have low process skills tend to have low critical thinking skills and moderate critical thinking skills. This can be seen in the achievement of the seven indicators of critical thinking, each of which has average achievements in students with average critical thinking. Students who have low overall critical thinking ability indicator achievement are characterized by thinking that is not aware of the proper standards in terms of clarity, accuracy, relevance, and limited thinking stages. The level of thinking that is not aware of the standard of logical thought relevance is included in the lowest thinking category, namely thinking that is not reflected while thinking with limited insight is included in the category of challenging and initiatory thinking. Students who can form science process skills will help students master the next skill [41] Students who have science process skills will think critically. Critical thinking skills are required to understand the concept well [42]

With this research, students become motivated to improve process skills and critical thinking skills through practical activities to become more active and more familiar with learning concepts and improve student learning outcomes. Teachers know learning techniques that can improve science process skills and students' critical thinking skills so that teachers can be more innovative and creative. The teacher can also find out the

extent of science process skills and students' critical thinking skills through the practicum. The results of this study can be used as input for the school to apply practical methods to improve students' science process skills and critical thinking skills, as well as improving the quality and function of schools as educational facilities and infrastructure.

IV. CONCLUSION

Science process skills and junior high school students' critical thinking skills on density material are classified as low. The results of the Pearson correlation analysis that have been conducted show that there is a weak correlation between science process skills and students' critical thinking skills. Students who have low scientific processing skills will have low critical thinking abilities, and vice versa. The importance of science process skills for junior high school students is that students learn meaningfully using knowing and being actively involved in discovering concepts from existing phenomena in the environment. The meaningful learner is learning that involves students directly, and learning will be easy to remember.

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