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Research Article

A Secondary School Student's Critical Thinking Ability Profile in Natural Science Subject Matters Based on Learning Style

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ABSTRACT

This research aims to describe students' critical thinking ability in science subjects based on learning style. The research method uses qualitative research with phenomenological approaches. The research site was conducted at SMP Muhammadiyah 5 Tulangan Sidoarjo. Data retrieval techniques using tests, questionnaires, and interviews. Data analysis techniques using the Miles & Huberman model include data reduction, data presentation, verification and conclusions. There are 6 indicators of critical thinking abilities revealed that include interpretation, analysis, evaluation, inference, explanation, and self-regulation. The study only used 5 indicators of critical thinking ability without self-regulation, this is because they cannot be revealed in a short time. The results of the study found that (1) indicators achieved in visual learning styles include interpretation, evaluation, and inference, (2) indicators achieved in auditorial learning styles namely interpretation, analysis, evaluation, and explanation, and (3) indicators achieved in kinesthetic learning styles namely: interpretation and evaluation. All subjects achieved not same indicators, while the all subjects also did not achieve all indicators of critical thinking ability. Further research is expected to be the efforts of natural science teachers in achieving all indicators of critical thinking ability, among others by doing habituation and consistent in training critical thinking ability.

INTRODUCTION

The globalization era is also called the age of knowledge. In the age of knowledge, several skills must be possessed, including technological literacy and communication skills, critical thinking skills, problem solving skills, effective communication skills, and collaborating skills (Sholikah and Ismail, 2018). The globalization era has a considerable impact in various aspects of life, one of which is in the field of education.

In education, students are required to have critical thinking ability and solve problems. Critical thinking ability is an intellectual process that involves thinking analysis for the purpose of evaluating information obtained from observations, experiences, reflections, reasoning, or communication that is ultimately used to make a decision. Critical thinking

ability are also needed in people's lives, because in life in the community is always faced with problems that require resolution. Students are required to use their knowledge by practicing reasoning and developing cognitive strategies to be able to find solutions or problems faced so that their intellectuals will also improve (Kuswana, 2011). Thus, given the importance of critical thinking ability, curriculum-2013 has now been implemented as an improvement of the Tingkat Satuan Pendidikan-Curriculum. Learning in the classroom, it is expected that teachers only facilitate students in developing thought processes and encourage reflecting on their abilities (Manfaati, 2017).

In the ability to solve problems, each student has different thoughts. These different thoughts will result in students getting different conclusions or solutions. The difference is due to different learning styles. In line with slavin's opinion (2006) that each student has a different style of solving problems and when students study.

Based on different methods of learning students, students' thinking abilities also vary. It has been observed by researchers that students in solving individual questions have differences. Observations are made when students are given questions that measure high-level thinking skills, where each student has different solving patterns, some do number sequences, some do by choosing questions that are considered easy, and some do random questions as they see fit. The characteristics of different students sometimes make it difficult for teachers to convey materials. The results of interviews with teachers and principals that the demands of learning using curriculum update namely Curriculum-2013, as well as teachers of SMP Muhammadiyah 5 Tulangan Sidoarjo have trained critical thinking skills, namely by building basic skills such as considering how students can be trusted, training students to always express their opinions to take attitudes and decisions, and always build open discussions with students. It also helps students be trained and accustomed to asking for something from every information they get.

Based on different ways of learning students, students' thinking abilities also vary. It has been observed by researchers that students in solving individual questions have differences. The characteristics of different students sometimes make it difficult for teachers to convey materials. The results of interviews with teachers and principals that the demands of learning using the curriculum update namely the achievement of critical thinking skills can affect the learning process of teaching. One of the factors that influences academic success or student success in the classroom is the learning style. Tiffani's research (2015) states that learning styles affect students' critical thought processes. According to Nurbaeti (2015) shows that there is a positive or interfluencing relationship between learning styles and critical thinking skills. According to Grasha (in Urals, et al 2015) states that learning styles are personal traits that affect a student's ability to absorb information, a student's relationship with a friend and the teacher's involvement in the learning experience.

Students' learning styles are known to vary, this is important in the progress of education and its success (Deporter, 2002). When developing a student's critical thinking skills, each teacher is confronted with students who have different characteristics between each other. One of the things that teachers should pay attention to in teaching is to know their protégé, know his skills, his interests and limitations, and his learning style, so that the given and how the achievement of the subject matter can be adapted to the characteristics of his students. Thus, the student can be more motivated in learning so that it is expected that the learning results will be better.

Thus it can be said that critical thinking skills and learning styles have a connection to each other to solve problems effectively. Researchers are interested in uncovering the facts that occur about the critical thinking ability profile of secondary school students in solving of natural science subject questions based on learning style.

METHOD

The research method uses qualitative research with phenomenological approaches. The data sources in this study are primary data sources and secondary data sources (Sugiyono, 2019). The primary data source is the data source in a study that is researched to obtain data by providing tests of critical thinking ability, questionnaires, and interviews. In this study, there were 3 students with different learning styles, consisting of visual, auditorial, and kinetic learning styles. The secondary data sources are data obtained from various sources, are journals, articles, books, and so on. The data collection techniques in these researchers use tests, questionnaires, and interviews. The data analysis techniques using the Miles & Huberman model (2014), such as data reduction, data display, verification and conclusions. At the data reduction stage, the data classification of research results is carried out and then organizes the data. At the data display stage, researchers compile relevant data and have meaning to answer research problems. At the verification and conclusion stage, researchers verify field records, coding, or conversation results and draw temporary conclusions. Checking the validity of data using triangulation techniques, namely tests, questionnaires, and interviews. According to Meleong (2016), triangulation is an examination technique of validity, in which the results of research can be accounted for, then it is necessary to check the data so that the data presented is valid or not. For the research stages there are 4 namely: (1) pre-field stage, (2) field activity stage, (3) data analysis stage, and (4) report writing stage (Arikunto, 2019).

RESULTS AND DISCUSSION

The following data will be presented:

1. Critical Thinking Ability Student's with Visual Learning Style

Table 1. Data of Visual Learning Style

Indicator	Numb. of Test	Test Score	Quest. Result	Interviews Result	Description
Interpretation	1	5	Agree	√	Credible
	2	5	Disagree	-	Not Credible
	3	1	Disagree	-	Not Credible
Analysis	4	1	Agree	-	Not Credible
	5	5	Agree	√	Credible
	6	2	Agree	-.	Not Credible
Evaluation	7	3	Very Agreeable	-	Not Credible
	8	5	Agree	√	Credible
	9	2	Agree	-	Not Credible
Inference	10	3	Agree	√.	Credible
	11	3	Agree	√	Credible
Explanation	12	1	Disagree	√	Credible
	13	2	Agree	-	Not Credible
	14	5	Agree	√	Credible

Based on Table 1, it can be described as follows: in interpretation indicators, students with a visual learning style are sufficiently capable of determining the information contained in the question. This is because students with a visual learning style are slightly less complete in writing the problems asked, especially the completeness of the information obtained from the question that has been given. It is according to Depoter & Mike (2001) that someone with a visual learning style sometimes loses concentration when wanting to pay attention to something. When students with a visual learning style begin to focus on the problem, sometimes they lose concentration causing some information to be left behind during the problem-solving process.

In the analysis indicator, students with visual learning styles have not been able to identify the relationship of the information contained in the problem. This is in accordance with Jaenudin (2017) saying that students with visual learning styles have not been able to identify the formulas or concepts used.

In the evaluation indicator, students with a visual learning style are quite able to explain a concept or theory on the given question. This is in accordance with Jaenudin (2017) saying that visual students give incomplete answers and incorrect answers and do not provide analogies.

In the inference indicator, students with a visual learning style are able to identify a problem in the test question and make conclusions that match the reasonable test results. It is also supported by Tiffani (2015) showing that students with a visual learning style are able to process information and store information by writing on the answer sheet.

In the exhibition indicator, students with a visual learning style are quite capable in explaining and stating the results of their thinking based on the evidence disputed. It is also supported by Tiffani (2015) that students with visual learning styles do not write down what is known according to the question. According to Zahroh (2017) stated that at this stage of understanding the problem of visual subjects is only able to read information without writing down what information it obtains.

Base on Pradika et al (2019), Visual Climber students have the power to control and can survive in difficulties and try to find the best solution, Camper-Visual students tend to find safe when in trouble and do not want to maximize their abilities while the Quitter-Visual students quickly give up and break away from responsibility in completing problem given. Although different in facing difficulties, the three types of students are generally the same in visualizing problems. This can be said even though the types of visual learning styles are different, but still the same in visualizing the given problem, in solving problems that measure critical thinking abilities. The solving critical mathematical thinking problems conducted by students who have a visual learning style, it will be easier to capture and remember material by using media in the learning process (Ulfiana et al., 2018).

However, some cases state that teachers pay attention to the student's learning style in teaching is important. This is in accordance with the results of Umar & Rathakrishnan (2012), learning style, especially the active-reflective dimension, is not an issue in learning, therefore, educators should not be too concerned on these differences in delivering an instruction.

2. Critical Thinking Ability Student's with Auditorial Learning Style

Table 2. Data of Auditorial Learning Style

Indicator	Numb. of Test	Test Score	Quest. Result	Interviews Result	Description
Interpretation	1	5	Agree	√	Credible
	2	5	Disagree	-	Not Credible
	3	1	Disagree	-	Not Credible
Analysis	4	1	Agree	-	Not Credible
	5	5	Agree	√	Credible
	6	2	Agree	-.	Not Credible
Evaluation	7	3	Very Agreeable	-	Not Credible
	8	5	Agree	√	Credible
	9	2	Agree	-	Not Credible
Inference	10	3	Agree	√	Credible
	11	3	Agree	√	Credible
Explanation	12	1	Disagree	√	Credible
	13	2	Agree	-	Not Credible
	14	5	Agree	√	Credible

Based on Table 2, it can be described as follows: on interpretation indicators, students with auditorial learning styles are able to determine the information contained in the question.

It is according to Depoter & Mike (2015) that someone with auditorial learning style find it difficult to write, but great at storytelling. At this stage of clarification students with auditorial learning style can mention the information obtained in the question during the interview.

In the analysis indicator, students with auditorial learning styles are sufficiently able to identify the relationship of the information contained in the question. It is in accordance with Tiffani (2015) that auditorial subjects perform inappropriate information processes resulting in incorrect end results.

In the evaluation indicator, students with auditorial learning style are quite able to explain a concept or theory on the question that has been given. It is also in accordance with Amir (2015), someone with an auditorial learning style in the critical thought process in solving problems quite able to write down what is asked of the question.

In the inference indicator, students with auditorial learning styles of students with auditorial learning styles are less able to identify a problem that exists in the test question and make conclusions that correspond to reasonable test results. This is in accordance with the results of Tiffani's research (2015) showing that students with auditorial learning styles are less able to reach the final conclusion to answer the requested question.

In the exhibition indicator, students with auditorial learning styles are less able to explain and express thought results based on the evidence processed. Zahroh (2017) says that students with auditory learning styles are slightly less able to complete plans quickly and appropriately.

The interaction between the learning model, motivation (high and low), and VAK learning styles affects students' critical thinking ability. So that students' critical thinking ability can be improved through the learning model by taking into several factors such as students' motivation and learning styles (Rini, et al 2020). The cause of high critical thinking ability of students, not only on the learning model and motivation level, but also there are other factors such as learning style. Based on Purwanto et al (2020), student auditorial; repeating material that is considered important by using rhythmic intonation of sound, using media in the form of learning videos that have sound effects. These results are in accordance with the results of the research conducted.

3. Critical Thinking Ability Student's with Kinesthetic Learning Style

Table 3. Data of Kinesthetic Learning Style

Indicator	Numb. of Test	Test Score	Quest. Result	Interviews Result	Description
Interpretation	1	4	Agree	√	Credible
	2	4	Agree	√	Credible
	3	1	Disagree	√	Credible
Analysis	4	2	Agree	√	Credible
	5	2	Agree	-	Not Credible
	6	1	Disagree	√	Credible
Evaluation	7	3	Disagree	-	Not Credible
	8	1	Agree	-	Not Credible
	9	1	Disagree	-	Not Credible
Inference	10	3	Agree	-	Not Credible
	11	1	Disgree	-	Not Credible
Explantion	12	1	Agree	-	Not Credible
	13	1	Agrre	-	Not Credible
	14	1	Agree	-	Not Credible

Based on Table 3, it can be described as follows: in interpretation indicators, students with a kinesthetic learning style are slightly less able to determine the information contained in the question. This is in line with the results of Safitri's research, et al (2018) that students

with kinesthetic learning styles seem less able to provide a simple explanation for not writing what is known.

In the analysis indicator, students with kinesthetic learning styles have not been able to identify the relationship of the information contained in the question. This is similar to the results of Zahroh research (2017) which stated that kinesthetic students are unable to sit still for a long time resulting in an inability to associate information acquisition to the form of writing.

In evaluation indicators, students with kinesthetic learning styles have not been able to explain a concept or theory on the given question. This is in accordance with the results of Jaenudin research (2017) said that students with kinesthetic learning styles have not been able to identify the formulas or concepts used.

In the inference indicator, students with a kinesthetic learning style have not been able to identify a problem that exists in the test question and make conclusions that correspond to reasonable test results. This is in accordance with Rosmasyiadi research results (2017) said that students with kinesthetic learning style are less able in terms of making final decisions.

In the indicator of explanation, students with a kinesthetic learning style have not been able to explain and state the results of thought based on the evidence processed. This is in accordance with the results of Amaliah's research, et al (2016) said that students with a kinesthetic learning style are less able to set strategies and provide a simple explanation because almost all answers to kinesthetic subjects do not write down assumptions in the question.

In each type of student learning style, both visual, auditorial and kinesthetic have better critical thinking skills (Muali et al, 2018). These studies indicate that every student, both those who have auditory, visual, or kinesthetic learning styles have different mathematical critical thinking abilities (Purwanto et al, 2020). Whereas students with kinesthetic learning styles in the process of critical thinking are able to mention all possible ways and the right answers that can be used so that in solving problems properly (Setiawan, 2020). Kinesthetic subjects can be said to have better critical thinking processes than visual and auditorial subjects (Amir, 2015).

CONCLUSION

Based on result and discussion, critical thinking ability of secondary school student's at SMP Muhammadiyah 5 Tulangan Sidoarjo in natural science subjects based on:

1. For visual learning style the indicator achieved are interpretation, evaluation, and inference.
2. For auditory learning style the indicator achieved are interpretation, analysis, evaluation, and explanation.
3. For kinesthetic learning style the indicator achieved are interpretation and evaluation

For the next researchers are expected to conduct the research by taking the data directly so that the data is valid, because in the current study using triangulation techniques with techniques: tests, questionnaires, and interviews researchers find it a little difficult when retrieving data because in the event of a pandemic covid-19 outbreak so that researchers by taking data online, but on test techniques, and interviews researchers take data directly / face to face, so that the phenomenon is revealed more deeply.

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