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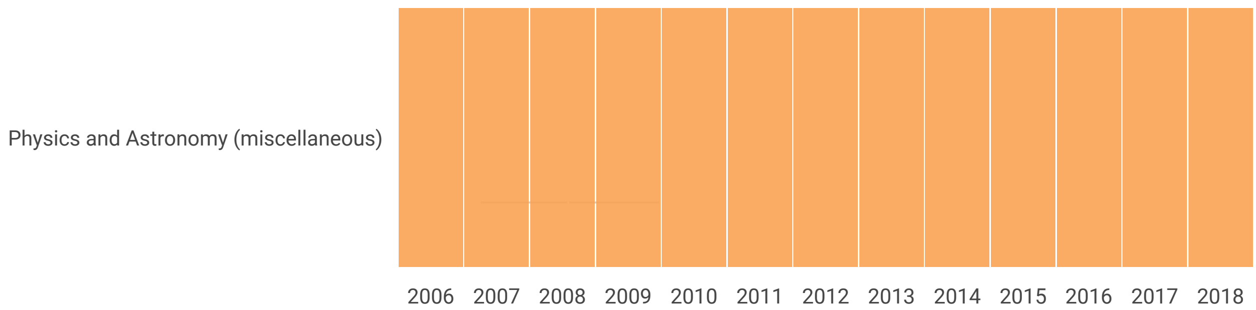

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The profile of Junior High School students' critical thinking skills and concept mastery level in local wisdom based on outdoor learning

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The profile of Junior High School students' critical thinking skills and concept mastery level in local wisdom based on outdoor learning

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Abstract. The aims of this descriptive research were describe profile of students' critical thinking skills, the profile of students' concept mastery through the implementation of local wisdom-based outdoor learning and the perspective of local wisdom-based outdoor learning and its potency to improve the critical thinking skills and concept mastery in the future. The sample involved 14 of 47 schools, 14 teachers and 40 students. The data were collected using interview worksheet for teachers and open-ended questionnaire for students and analysed using descriptive method. Few teachers did encourage students to have outdoor learning, and the facts showed that the students' critical thinking and concepts mastery level were low. Teachers commonly used power point presentation on teaching-learning activities to illustrate intangible learning object materials. The data analysis results showed a significant correlation between local wisdom-based outdoor learning and students' critical thinking skills and concept mastery level. Their profiles were low with an average of 53.85 % and 51.3 %. There was no implementation of local wisdom-based outdoor learning. Accordingly, local wisdom-based outdoor learning can be implemented to improve students' critical thinking skills and concept mastery level.
Keywords: *critical thinking skills, concepts mastery, local wisdom, outdoor learning*

1. Introduction

One of the 21st century skills the students must have is critical thinking skills [1]. Science learning requires constructivism learning, which builds a concept mastery based on students' experiences. The experiences are gained through observing, questioning, experimenting, analysing, communicating, and evaluating. The process is necessary to obtain 21st century skills. 21st century skills include skills that support modernization times. TIMSS (Trends in Mathematics and Science Study) in 2015 showed that Indonesia was the 44th place out of 47 countries with an average of 397. Data shows that Science learning is less acceptable to Students. Science Learning will be more meaningful when the objects are authentic. The students will gain a better understanding of the Science objects that have to do with their daily life, that can be learned by going outside of class. Students must possess 21st century skills to keep up with this fourth Industrial Revolution era. Previous research mentioned that critical thinking skills and concept mastery are still relatively low. Critical thinking and concept mastery skills are required for students to overcome various problems. The skills are needed to understand, analyse, and evaluate the abstract science material. The abstract concept is the basis to learn more about the concept of the material so that it should be well mastered. Yet, the students' concept mastery level is relatively low. Teachers' attempts are made by conducting learning outside the classroom and integrate the lesson materials with local wisdom to provide direct experience to the students. Local wisdom-based learning provides a direct experience to the students because the science, essentially is 1) a collection of knowledge; 2) way of thinking; and 3) how to investigate the universe. Integrating learning with local wisdom will make it easier for teachers and students to realize the nature of science. However, there are many obstacles in the implementation of such activities as cost, time, and energy [2] - [5].

Critical thinking is a practice that incorporates assessment or evaluation, such as assessing the feasibility of an idea or product. Rational and critical thinking is the embodiment of learning behaviour, especially with problem-solving. The student with critical thinking skills will be capable of understanding and answering the questions, such as "how" and "why." In terms of thinking, these critical students have to to use certain cognitive strategies to test the reliability of problem-solving ideas and to overcome errors or shortcomings. Critical thinking is a process that allows learners to judge many things: the witness, assumptions, logic, and the terms underlying the statement of others. From Expert opinion above, it can be known that the critical thinking skill is a process undertaken by skilled, active, and organized students, allowing them to evaluate evidence of observation and communication, information and argumentation. The goal of critical thinking is to obtain an in-depth comprehension. Due to the statement by the experts above, it can be known that critical thinking refers to the skill to think logically, reflectively, and productively. Critical thinking can be used in assessing the situation to make sound judgment and decision [6].

Critical thinking skills are divided into 5 aspects, namely, (1) Explain the basic clarification, (2) Build the primary skills, (3) make the inference, (4) give the further clarifications, (5) manage the strategies. The other aspect of critical thinking skill includes, (1) identify the problems, (2) demonstrate the understanding, (3) identify the inaccuracy, (4) split and and make group of issues, (5) identify the assumptions, (6) describe more than one solutions, (7) make the model of a problem, (8) identify the barriers, (9) confirm and ensure the solution, (10) withdraw the inference, (11) confirm or ensure the use of strategy, and (12) integrate the data. [7], [8]. Referring to indicators of critical thinking skills stated by experts, this study used these indicators, (1) provide the simple explanation, (2) connect a concept to another concept, (3) compare and distinguish the concept, (4) analyse and evaluate the concept, (5) make and deliver the conclusions, (6) criticize the local potency; (7) understand the integration local potency and science concepts.

The concept is something that genuinely exists. There may not only one definition that can reveal the meaning of the concept but also a lot of definitions of concepts that it necessary allows us to define concepts, as well as linking with other related concepts. Concept mastery is a result of a concept analysis, a procedure that is developed to help teachers to plan their sequences of the teaching sequence for the achievement of concepts. The concept analysis is conducted through seven steps, namely, (1) determine the name or label of concept, (2) conceptualize the definition, (3) categorize the concept, (4) choose the critical attributes, (5) choose the variable attributes, (6) determine the draft positions, (7) give the examples and non-examples. There are seven features or indicators of concept mastery namely,(1) restart a concept, (2) classify the objects according to certain properties or in accordance with the concept, (3) give the examples and non-examples of concepts, (4) present the concepts in various forms of mathematical representation, (5) develop necessary requirements or terms of sufficient concept, (6) use, utilize, and select the specific procedures or operations, and (7) apply the problem-solving concepts or algorithms.

Students as a scientist must understand theories and have high critical thinking skills which are expected to support the concept mastery. Preparing students to think deeply is the primary purposes for many academics in higher education, and it is also a quality that sought by most employers [9]. Critical thinking skills and concept mastery can be assigned by local wisdom-based outdoor learning. Local wisdom-based learning provides students with direct experience. A local basis, local wisdom emerges in the form of values, norms, customs, and knowledge. It serves as a natural resource conservation and preservation and as the code of conduct within an ecological community. Local wisdom is an ecological intelligence echoed in saying, attitude, behavior as well as the supporting system; hence, nature can be conserved. Although it pertains regionally, local wisdom has a universal sense.

Outdoor learning is one way to improve the quality of students' capacity. Compared to indoor classroom learning activities, outdoor learning provides students a more significant opportunity to learn in greater depth through real objects in their environment. Further, outdoor learning can help students to apply their knowledge. Also, outdoor learning is more challenging for students and bridging between theory in the book and the real objects. Outdoor learning is a learning approach that used atmosphere outside the classroom as a learning situation at a variety of games as a medium of transformation of the concepts presented in the study [10]. Researchers have considered the use of environmental education in schools, colleges, and universities [11], [12]. Researchers subsequently examine students' knowledge and attitudes towards the environments [13], [14] and methods for teaching environmental awareness [15]. Critical thinking skills and concepts mastery level of Junior High School students were investigated and described in this study as an effect of local wisdom-based outdoor learning.

2. Research method

This research is a descriptive study. The population of this study was Junior High Schools in Bantul in 2018/2019 Academic year. Samples of this study involved 14 of 47 Junior High Schools in Bantul, Indonesia, including 14 teachers and 40 students. This study was conducted in June-July 2019. The data of critical thinking skills were collected using interview worksheet, and those of concept mastery was measured by the open-ended questionnaire. Both instruments were construct validated before used. Interview worksheet consisted of 7 indicators namely: (1) providing a simple explanation, (2) connecting a concept to another concept, (3) comparing and distinguishing concept, (4) analysing and evaluating concept, (5) making and delivering conclusions, (6) criticizing local potency; (7) understanding the integration local potency and science concepts. Open-ended questionnaire consisted of 7 indicators: (1) restating a concept, (2) classifying objects according to certain properties or in accordance with the concept, (3) giving examples and non-examples of concepts, (4) presenting concepts in various forms of mathematical representation, (5) developing the necessary requirements or terms of sufficient concept, (6) using, utilizing, and selecting specific procedures or operations, and (7) applying problem-solving concepts or algorithms. The implementation of local wisdom-based outdoor learning was also described in this study from which the data were collected by the open-ended questionnaires. All data were analysed descriptively. The analysis included (1) organizing the data , (2) finding and organizing ideas and concepts, (3) building overarching themes in the data, (4) ensuring reliability and validity in the data analysis and in the findings, (5) ensuring reliability and validity in the data analysis and in the findings, (6) an overview of the final steps [16].

3. Results and Discussion

3.1. Profile of Students' Critical Thinking Skills Level

According to the interview with science teachers in Bantul regency Junior High School about Students' Critical Thinking, data from teachers are shown in table 1. There were two indicators of critical thinking skills that reached almost 100% agreement by teachers' perspective. Teachers said that all school components have to improve and evaluate the students' critical thinking skills levels. On the other hand, data from students are shown in table 2.

From the students' perspective, only 2 indicators out of 7 indicators that reached more than 50% agreement. The average score of students' critical thinking skills level, based on the students and teacher data agreement, was 53.85% (low) [17]. It means that the students' critical thinking skills should be improved. On the other hand, the average of disagreement by teachers and students was 46.14%. Skills in critical thinking are essential for lifelong learning and to deal effectively with a fast-changing world. The practice of critical thinking can be integrated with the elements of reasoning: the purpose of thinking, the main problem or question being considered, assumptions, point of view, evidence, concepts and ideas, conclusions or interpretations and implications or consequences. To teach a course using the method of critical thinking, the course must be conceptualized not as a set of content fields, but as a method of thinking that applies to solving problems raised in certain scientific disciplines, Students must master not only the language and concepts currently used in a discipline but also the way of thinking related to problem-solving in the field of study [18].

Table 1. Result of students' critical thinking skills level from teachers' perspective (n=14).

Statement	Agree	Disagree	Percentage (100%)	
			Agreement	Disagreement
Students can provide a simple explanation of the material that has been given	14	0	100	0
Students have the skills to connect the one concept with the other concepts	9	5	64.2	35.8
Students can compare and differentiate between fact and concept one with the others	8	6	57.1	42.9
Students can perform analysis and evaluation of learning materials	13	1	92.8	7.2
Students can make and deliver the conclusion of the materials	10	4	71.4	28.6
Students have the ability of critical thinking related to the phenomenon happening around especially regarding local potentials of the region	7	7	50	50
Students understand the integration of local potentials with learning Science materials	5	9	35.7	64.3
Average			67.31	32.68

Table 2. Result of students' critical thinking skills level by students' perspective (n=40).

Statement	Agree	Disagree	Percentage (100%)	
			Agreement	Disagreement
Students can provide a simple explanation of the material that has been given	18	22	45	55
Students have the skills to connect the one concept with the other concepts	12	28	30	70
Students can compare and differentiate between fact and concept one with the others	22	18	55	45
Students can perform analysis and evaluation of learning materials	12	28	30	70
Students can make and deliver the conclusion of the materials	22	18	55	45
Students have the ability of critical thinking related to the phenomenon happening around especially regarding local potentials of the region	14	26	35	65
Students understand the integration of local potentials with learning Science materials	13	27	32.5	67.5
Average			40.4	59.6

3.2. Profile of Students Concept Mastery Level

The interview results with science teacher in Bantul regency Junior High School about profile of students' concept mastery level are shown in table 3.

Table 3. Result of students' concept mastery level by teachers' perspective (n=14).

Statement	Agree	Disagree	Percentage (100%)	
			Agreement	Disagreement
Students can restate a concept	13	1	92.8	7,2
Students can classify objects according to certain traits or according to the concept	13	1	92.8	7.2
Students can give examples and non-examples of concepts	10	4	71.4	28.6
Students can present concepts in various forms of Mathematical representation	6	8	42.8	57.2
Students can develop the requirements or terms of sufficient concept	6	8	42.8	57.2
Students can use, utilize, and choose procedures or specific operations	8	6	57.2	42.8
Students can apply problem-solving concepts or algorithms	3	11	21.4	78.6
Average			60.1	39.9

On the other hand, the teachers did a formative assessment, summative assessment, final assessment, and attitude assessment. The score is under the minimum submission criteria 75. From that result, It can be said that only two categories of concept mastery reaching almost 100%. They were students' skills to make concepts and classify objects based on certain properties or according to the concepts. It can be said that out of seven indicators, two indicators were reached by the students, or 28.5 % indicators were reached by the students. It means that the mastery concepts of students should be improved. From the students' perspective, the results are showed in table 4.

Table 4. Data result of students' concept mastery level by students' perspective (n=40).

Statement	Agree	Disagree	Percentage (100%)	
			Agreement	Disagreement
Students can restate a concept	15	25	37.5	62.5
Students can classify objects according to certain traits or according to the concept	23	17	67.5	42.5
Students can give examples and non-examples of concepts	15	25	37.5	62.5
Students can present concepts in various forms of Mathematical representation	13	27	32.5	67.5
Students can develop the necessary requirements or terms of sufficient concept	21	19	52.5	47.5
Students can use, utilize, and choose procedures or specific operations	21	19	52.5	47.5
Students can apply problem-solving concepts or algorithms	11	29	27.5	72.5
Average			42.5	57.5

The result showed that all indicators did not reach near 100%. The average data result agreement based on the teachers' and students' perspectives was 51.3% (Low). It means the concept mastery level of students should be improved because the students only reached 51.3 % from all indicators. The average of data result in disagreement from teachers' and students' perspective was 48.7%.

Concepts understanding is one of the key aspects of the learning process that involves this level of thinking [19]. Conceptual understanding or concept mastery allows students to change the knowledge into multiple illustration and apply them in daily life [20]. Conceptual understanding is the process of acting to understand correctly about an abstract design and idea that allows one to classify objects or events, and conceptual understanding obtained through the learning process [21]. Understanding the process of changing knowledge is a major goal in development studies and education. Two types of conceptual knowledge that children acquire are conceptual understanding and procedural skills [22]. Therefore, conceptual understanding can change students' perceptions of topics in physics, motivated by a desire to change the mode of passive teaching that is prevalent and to involve students in active learning that is enhanced by technology [23].

The concept mastery has a significant correlation with critical thinking skills. It is shown from the profile of students' critical thinking skills and concept mastery that must be improved. It is because concepts consist of contents that are studied more deeply as a result of being part of and relevant to an involving thought process. Content comes alive in the form of thinking and dies when one tries to learn it without thinking [26]. All content "lives" in the form of thought. Only those who can "think" through the content that owns it. All content "dies" when someone tries to learn it without thinking. Only by thinking students can "master" the content and release it from their content. Only to the extent that a student asks original questions and seeks answers for them, a student taking content seriously and thinking about it [24].

3.3. Description of The Implementation of Outdoor Learning

An outdoor learning method can be used to held the contextual learning by utilizing nature and based on outdoor learning [25]. Outdoor learning is beneficial to develop children's character and insight as a miniature of real-life. Local wisdom-based education teaches students to always be in the concrete situation they are facing. The situation is associated with the culture in the region and the problem that will occur in the future can be resolved [26]. Outdoor learning has benefit for students to engage in outdoor learning that have demonstrated an increased ability to think creatively and critically and an improved performance on standardized tests. Outdoor learning also has benefit to the teachers that have reported renewed enthusiasm for learning, it also has benefit the community has benefited from having active students and engaged critical citizens [27], [28]. All teachers said that learning outdoor learning is excellent for students to interpret the learning, especially the abstract material. 34 out of 40 Students said that learning outside the classroom is fun and enjoyable. However, based on the result of the interview, outdoor learning was not fully implemented by teachers, 9 out of 14 Teachers have been inviting students to visit the local potential of earthenware. Only four out of forty students state that they were often invited to study outside the classroom by the teachers. They thought that there were a lot of constrains to face to hold outdoor learning such as cost, time, efficiency, and student management. Similar to teachers' opinions, students thought that there were some of the constraints faced when studying outside of school like time, cost, and transportation. Five barrier keys of outdoor learning, namely: (1) Fear and concern about young people's health and safety (e.g., issues around liability). (2) Teacher's confidence and expertise in teaching and learning outdoors (e.g., lack of pre- and in-service training for teachers). (3) The requirements of school curricula (e.g., mandated curriculum leaves little room for outdoor learning, not enough time to undertake outdoor learning, standardized testing makes it difficult to assess outdoor learning, and outdoor learning is only incorporated into subjects such as science). (4) Shortages of time, resources and support (e.g., too much extra work for teachers, lack of funding, transportation complications). (5) Wider changes within the education sector and beyond (e.g. larger class sizes, institution-wide timetables limit opportunities for fieldwork, emphasis on back to basics) [29].

Because of some constraints of outdoor learning, the teachers use technology like pictures, animation, and video to deliver the intangible science materials, 26 from 40 Students said that the media used by teachers were interesting. 28 from 40 Students also used video and pictures to learn the abstract materials. Using technology can complete the outdoor learning, but outdoor learning still has its function to deliver the materials, substantial evidence to indicate that fieldwork, properly conceived, adequately planned, well taught, offers learners opportunities to develop their knowledge and skills in ways that add value to their everyday experiences in the classroom. We can apply outdoor learning by paying attention to some factors below: (1) age; (2) prior knowledge and experience; (3) fears and phobias; (4) learning styles and preferences; (5) physical disabilities and special educational needs; (6) ethnic and cultural identity; (7) the setting [30].

3.4. Perspective, Local Wisdom-Based Outdoor Learning and The Potency to Improve the Critical Thinking Skills and Concept Mastery in The Future

The description of the implementation of local wisdom-based outdoor learning shows that not all schools in Bantul implemented local wisdom-based outdoor learning. It means that local wisdom-based outdoor learning can be implemented in the learning method to improve students' critical thinking skills and concept mastery. The result about perspective local wisdom outdoor learning showed by 14 teachers' opinion about local wisdom as a concern in a local potential that the other place does not have. On the other hand, the students' opinion about local wisdom is something unique and different from other areas. 13 from 14 teachers (92.8%) know the local wisdom in their environment. 13 from 14 Teachers (92.8%) understand about the nature of learning by utilizing local potentials around the school, all of them were interested in doing learning by local wisdom because they agreed that curriculum facilitates local wisdom-based learning. 13 from 14 (92.8%) teachers know the local potential of earthenware. They thought that they could connect the earthenware potential in science learning by integrating it with science materials such as pressure, temperature, and substance properties. 37 from 40 Students (92.5%) also knew the local earthenware potential. 29 from 40 Students (72.5 %) knew that the local earthenware potential could be integrated into the science learning. 31 from 40 (77.5%) students thought that learning media with local wisdom is interesting.

They considered that local wisdom-based outdoor learning could improve the students' ability in understanding the concept of materials. The concepts of physics or science will be more inherent in learners when the concept can be found and self-proven by them, accordingly, activity is needed to realize the goal [31]. Nature as an educational medium is an effective means of improving knowledge and developing a person's thinking skills because by utilizing nature, learners will be motivated to discover new things, which will later into a project [32]. Outdoor learning could improve learner's processing skills and understanding of a concept.

This descriptive analysis of students' critical thinking skills and concept mastery, the implementation of local wisdom outdoor learning, showed that there is a correlation between local wisdom outdoor learning, students' critical thinking skills, and students' concept mastery. We can see from the analysis that the teachers did not invite the students to local wisdom-based outdoor learning. It makes the students' critical thinking skills do not appear as good as when outdoor learning is applied. Teachers need to invite students to learn outside, and students will find out the real knowledge beside knowledge from the textbook because sometimes the textbook does not provide complete materials from local wisdom. Instead, it develops an awareness of the complexities of the real world and can help to develop critical thinking skills. Students can improve critical thinking skills through outdoor learning because they could understand the concept themselves in environmental learning or observation. They can conclude the knowledge themselves [33].

The critical thinking also has a significant correlation with the students' concept mastery because since by critical thinking skills, students get and understand the concept easily, sensitive to solve the problems, and can apply the concept in different situations [34]. Critical thinking skills can invite students to see a problem in other perspectives. It can also lead students to analyze the facts that occurs by looking at the strengths and weaknesses of the circumstances. Students will have the willingness to express ideas, students will have curiosity, flexibility, open-minded, honesty, cautious in making a judgment, clear-minded, organized and traceable in solving a problem, and persistent in gaining optimal results with critical thinking skills. Critical thinking should be improved in learning curriculum, teaching and learning process to get students with future leaders' thinking quality [35].

Students' critical thinking skills and conceptual understanding or concept mastery have a positive correlation with students' learning outcome in mechanics (science) concept [36]. A main feature of the learning process to be a competent student is the ability to self-evaluate and continually improve the thinking ability. Application of critical thinking skills in learning process can help to overcome the future problems [18].

4. Conclusion

The present study concludes that the profile of students' critical thinking skills and concept mastery levels were low with an average of 53.85 % and 51.3 %. Several science teachers in Bantul Junior High School did not invite the students to learn outside the class. They use multimedia and technology to deliver abstract science materials. There is a correlation between local wisdom based-outdoor learning and students' critical thinking skills and mastery of concept level. The outdoor learning can be implemented by paying attention to some factors. Critical thinking skills must be applied and improved in the learning curriculum, teaching and learning process to obtain students with good critical thinking skills as future leaders.

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