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Profile of Learners' Scientific Literacy Through Local Culture-Based Learning of Dhadak Merak Reyog Ponorogo Dance

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Abstract: Students' scientific literacy can be trained by integrating local culture into learning. The integration of local culture into learning science can provide insight to students to process local culture into something meaningful in learning science. The purpose of this study was to determine differences in students' scientific literacy abilities before and after integrated science learning with local culture, the Dhadak Merak Reyog Ponorogo dance. The type of research used in this research is descriptive quantitative. The sample selection was carried out by cluster random sampling consisting of 20 students in class VII D. This research was conducted at SMP Negeri 3 Depok, Sleman, Yogyakarta. The instruments used in data collection were questionnaires, observation sheets, and scientific literacy tests on competency aspects adopted from the OECD. Data research techniques using the Wilcoxon test with the help of SPSS 25 software at α (0.05). The results showed that: (1) there was an increase in students' scientific literacy through learning science based on the local culture of the Dhadak Merak Reyog Ponorogo dance as indicated by the sig (2-tailed) value of 0.001 <α (0.05); (2) The average scientific literacy ability of students at the posttest (57.47) is higher than the average literacy ability of students during the pretest (44.12).

Keywords: Dhadak Merak Reyog Ponorogo Dance; Science Literacy; Science Learning; Local Culture

Pendahuluan

Local cultural content is an important consideration in curriculum development, so that students are not only familiar with content originating from Western thought, but also familiar with content contained in the local culture of their respective regions. Thus the preservation of culture, values, and social norms originating from local culture is maintained from generation to generation (Musfiqon & Nurdyansyah, 2015). Local culture from a certain area can be integrated into learning in schools, one of which can be included in science learning (Dewi et al., 2019).

Science is a science that studies everything about nature and everything in it through the scientific method (Lestari et al., 2020). Science plays the role of knowledge that can help humans to develop abilities about how to think, be rational, creative, analytical, critical, develop essential skills in scientific research, the ability to solve systematic problems scientifically, and make decisions based on accountable evidence (Jamaludin et al., 2019).

There are three aspects in learning science, namely aspects of knowledge, processes, and how to understand science. The knowledge aspect refers to facts, concepts, and information. In the process aspect, students are directed about how students observe, explore, and create. In the aspect of understanding science, students are taught that how to acquire scientific knowledge is more important than just learning facts, concepts, and theories (Aisah, 2020; Mulyeni et al., 2019; Rochmawati et al., 2019). A person's ability related to knowledge of scientific concepts and processes which makes the basis for both decision-making and solving life's problems through scientific methods is called scientific literacy ability (Lestari et al., 2020).

Scientific literacy is defined as participation in various scientific issues that affect one's thinking (Mellyzar et al., 2022). Scientific literacy refers to an individual's understanding of science, its processes, and its application in everyday life in society (Jamaludin et al., 2019; Lestari et al., 2020). PISA 2015 defines scientific literacy as the ability to engage in issues related to

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science, and use scientific knowledge in solving problems in society (OECD, 2016). Based on these definitions, scientific literacy is defined as a person's ability to understand scientific concepts and procedures and apply scientific knowledge to everyday problems.

The main goal of studying science is the development of scientific literacy which includes understanding science, including its principles and development (Alim et al., 2020). Everyone who is scientifically literate has the following characteristics: 1) maintains a positive attitude towards science at all times; 2) able to utilize logic; 3) understand scientific concepts and principles and be able to apply them in technology and society; 4) understand the relationship between human values and society, technology, and science (Alim et al., 2020).

Students' scientific literacy is considered a basic skill that must be mastered and developed (Nurcahyani et al., 2021). Science content, science processes, and science context are usually measured as scientific literacy (Dwisetiarezi & Fitria, 2021). According to the Program of International Student Assessment (PISA) understanding of facts, ideas, and basic theories of scientific knowledge is called knowledge or content aspects; Competency aspects such as the ability to explain scientific phenomena, evaluate and design scientific investigations, and interpret data and evidence scientifically; and Context aspects which include personal, local or national, global, and historical issues that require an understanding of science and technology (OECD, 2016; OECD, 2019).

PISA interprets the results of the average scientific literacy score for Indonesian students in 2012 which is 382 points which places them in 64th place out of 65 countries, in 2015 which is 403 points which places them in 69th place out of 76 countries, and in 2018 which is 396 points which ranking them 62nd out of 71 countries (OECD, 2016; OECD, 2019). Based on these findings, Indonesian students have a relatively low level of scientific literacy achievement in terms of knowledge, competence, and scientific context (Asikin & Yulita, 2019; Dewi et al., 2021; Hadiprayitno et al., 2021; Santoso et al., 2022). According to a number of research findings, the low scientific literacy of Indonesian students is caused by several factors, one of which is their belief that Western science is more important than local culture-based science (Atmojo et al., 2019). Students assume that local science is strange and contradicts scientific knowledge. They assume that local science has less explanatory power than Western science which has produced knowledge that can be tested, predicted, and explained (Handayani et al., 2019). In addition, there is a cultural discrepancy between the culture of students and the culture in schools. Teachers who are not aware of this prefer to think the same way. Because local culture has not been scientifically proven, teachers are afraid to incorporate it into science lessons. Local culture has not been fully integrated in several learning processes, especially science learning (Handayani et al., 2019; Sarwi et al., 2020). Integrating local culture into science learning is one approach that can be taken to develop students' scientific literacy skills (Dewi et al., 2021; Dewi et al., 2017; Parmin & Fibriana, 2019). The Dhadak Merak Reyog Ponorogo dance is one of the local cultures that can be used in science lessons.

Reyog Ponorogo is a Javanese cultural art in the form of staging art which contains elements of dance, drama and music. Reyog Ponorogo is presented in the form of a dance drama without dialogue (Agustina & Destya, 2022). In Ponorogo Regency, East Java, Reyog Ponorogo is a type of traditional dance that has been passed down from generation to generation and has been preserved by all levels of society. Prabu Klono Sewandono, Bujangganong, Warok, Jathil, and Singo barong/Barongan/Dhadak Merak are some of the players in Reyog Ponorogo. Dhadak Merak/Barongan is the most important equipment in the Reyog Ponorogo show (Agustina & Destya, 2022; Rahmanto et al., 2021; Wulansari & Admoko, 2021). Dhadak peacock is a tiger head mask with a peacock on it. They weigh between 20 and 30 kilograms for the mini size and 50 to 60 kilograms for the adult size. Caplokan made of wood, bamboo and rattan in the shape of a tiger's head is part of the dhadak merak or Barongan. Caplokan is covered in genuine kingpin tiger skin and has a crown of peacock feathers on top. Dhadak Merak performers lift and wear Dhadak Merak masks during the performance. The majority of Dhadak Merak players use the strength of their teeth to play the Dhadak Merak which is used in the performance which weighs between 50 and 60 kilograms (Suryanti et al., 2017; Wulansari & Admoko, 2021).

The Dhadak Merak dance movements contain several scientific concepts that can be applied to science learning, including the concepts of Force and Newton's Laws. The concept of style in the Dhadak Merak dance is found when performers dance the Dhadak Merak dance which requires a pulling force and a pushing force. During the show, the dancer holds the Dhadak Merak from end to end and then the dancer pushes the Dhadak Merak forward while shaking it which aims to cause motion on the Dhadak Merak (Agustina & Destya, 2022).

The next concept contained in the Dhadak Merak dance is Newton's Law which is divided into Newton's First Law, Newton's Second Law, and Newton's Third Law. Newton's first law is the law of inertia. This law reads "an object at rest will always be at rest, or an object that moves regularly will continue to move regularly as long as there is no force acting on the condition of the object". The Dhadak Merak dance also contains the concept of Newton's First Law. When the position of Dhadak Merak is standing straight with the palms facing

forward, the arms form the elbows, the head position is facing forward, the neck supports the weight, the player's teeth bite the Dhadak Mrak mask, and the feet are open in a low position. The pressure on the player's neck is a strong point for this situation, so that it can really hold the Dhadak Merak in a stable or balanced state (Wulansari & Admoko, 2021).

The Law of Acceleration is Newton's Second Law. This law reads "The acceleration of an object is directly proportional to the magnitude of the force and inversely proportional to its mass". The Dhadak Merak dance also contains this legal concept. The application occurs when the player moves the Dhadak Merak with his shoulder (Wulansari & Admoko, 2021).

The next concept is Newton's Third Law. This law is known as the Law of Action-Reaction. Newton's third law reads "When an object exerts a force on a second object, the second object also exerts a force that is equal in magnitude but opposite in direction". In the Dhadak Merak dance, this law is found when the dancer maintains the balance of the Peacock dhadak. The lifting force of the player's head to maintain the Dhadak Merak mask is represented as the reaction force given by the player to the mask, while the action style is represented by the Dhadak Merak mask which presses the dancer's head and points to the center of the earth (Wulansari & Admoko, 2021).

Based on previous research by Dewi et al. (2017) that science learning combined with the local potential of woodcarving and pottery influences students' critical thinking skills (Dewi et al., 2017). Atmojo et al (2021) states that students' scientific literacy skills can be improved through local culture-based learning (Atmojo et al., 2021). Fuadati & Wilujeng (2019) that the curiosity of students can be increased through the use of web-LKPD IPA which integrates the potential of local sugar factories into learning (Fuadati & Wilujeng, 2019). Anisa (2017) in his research results also stated that science learning integrated with Jepara's local potential proved effective in improving students' critical thinking skills (Anisa, 2017). The results of these previous studies have provided an illustration that the integration of local culture into science learning has proven to be effective. The results of the research above have contributed as a basic foundation in the research that will be carried out regarding the integration of local potential in science specific learning. This research integrates local potential in the form of the cultural arts of the Reyog Ponorogo dhadak merak dance in science learning.

Based on the results of observations and interviews with science teachers at SMP Negeri 3 Depok, Sleman, Yogyakarta, it was found that the applied science lessons did not integrate local culture. In addition, the teaching materials used are based on books published by the Ministry of Education and Culture, where the published books have not yet integrated local culture into their learning content. This affects the results of the pretest given with the average result of the pretest value below the standard value of the minimum completeness criteria. Integration of local culture into learning can provide insight to students to process local culture into meaningful things in learning (Fuadati & Wilujeng, 2019). Departing from the problems above, it is necessary to integrate the local culture of Dhadak Merak Reyog Ponorogo Dance into science learning.

Metode

This research is a type of quantitative descriptive research. The purpose of this study was to measure scientific literacy skills before and after science learning was applied which was integrated with the local culture of the Dhadak Merak Reyog Ponorogo dance. The population used was class VII at SMP Negeri 3 Depok, Sleman, Yogyakarta. The sample selection was carried out by cluster random sampling method. The class selected as the sample was class VII D, which consisted of 20 students. This research was conducted from 26 October 2022 to 10 November 2022. The data analysis technique used was the Wilcoxon test with the help of SPSS 25 software. The learning tools used included the Independent Curriculum Teaching Module, Student Worksheets, and Teaching Materials (Handout) in the form of an electronic module.

The research instruments used to collect data are questionnaires, observation sheets, and scientific literacy test instruments on competency aspects adopted from the OECD (2019). The form of the test used is multiple choice. The aspects and indicators of scientific literacy are presented in Table 1. This study used a one group pretest-posttest design. The illustration of the one group pretest-posttest design is presented in Table 2.

Table 1. Aspects of Science Literacy (OECD, 2019)

Aspects of Scientific Literacy	Science Literacy Indicator	Question Number
Competence	Explain phenomena scientifically	1, 2
	Evaluating and designing scientific investigations	3, 4
	Interpret scientific data and evidence	5, 6

Table 2. Research Design

subject	Pretest	Posttest
One Group	O_1	O_2

Information:
O1 = Pretest value prior to the implementation of integrated science learning with local culture, the Dhadak Merak Reyog Ponorogo Dance.

O2 = Posttest score after implementing integrated science learning with local culture, the Dhadak Merak Reyog Ponorogo dance.

Results and Discussion

The results of scientific literacy analysis on competency aspects based on each indicator are presented in Figure 1.

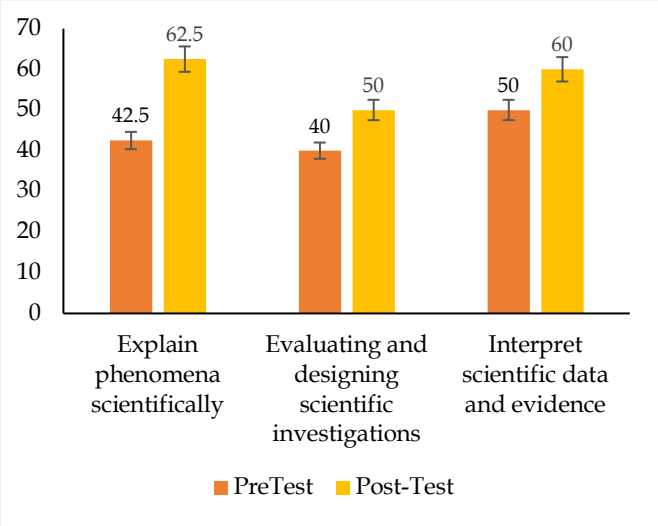

Figure 1. Pretest and posttest scores of scientific literacy competency aspects on each indicator

Figure 1 shows the results of the scientific literacy scores of students in class VII D through a multiple choice form test before and after applying science learning based on the dhadak merak dance in Reyog Ponorogo. Based on Figure 4, the results of the analysis of students' scientific literacy on the indicator of explaining phenomena scientifically obtained a score of 42.5 in the pretest and 62.5 in the posttest. On the indicators of evaluating and designing scientific investigations, a score of 40 was obtained on the pretest and 50 on the posttest. Then on the indicator of interpreting data and scientific evidence, a score of 50 was obtained on the pretest and 60 on the posttest. This can be interpreted that there are differences in students' scientific literacy competence in each indicator between before and after the use of local culture-based science learning tools, the dhadak merak dance in Reyog Ponorogo. To find out whether there is a significant difference in students' scientific literacy abilities between before and after using the local culture-based science learning tool of dhadak merak dance Reyog Ponorogo, the Wilcoxon test was carried out through SPSS 25 software. The Wilcoxon test results are presented in Table 3.

Table 3. Wilcoxon Test Results

	N	Mean	Asymp. Sig (2-Tailed)
Pretest	20	44.12	0.001
Posttest	20	57.47	

Table 3 shows the results of the Wilcoxon test analysis which explains whether or not there is a significant difference between before and after the use of local culture-based science learning tools, the dhadak merak dance in Reyog Ponorogo. Based on table 3, it shows that the sig (2-tailed) value is smaller than alpha (0.05) so that H0 is rejected. This shows the meaning that there is a significant difference in students' scientific literacy skills between before and after the use of local culture-based science learning tools dhadak merak dance Reyog Ponorogo. This difference can be seen in the increase in scores in each indicator of scientific literacy in the competence aspect.

In the first indicator, namely explaining phenomena scientifically, there was an increase from an average value of 42.5 to 62.5. In this indicator students are invited to identify the concept of Newton's First Law in a picture of a peacock's dhadak standing upright and identify the suitability of Newton's Law concepts through the four statements that have been provided regarding the motion of the dhadak peacock dance in Reyog Ponorogo.

In the second indicator, namely evaluating and designing scientific investigations, there was an increase from the average score of 40 to 50. In this indicator, students were invited to evaluate the role of Newton's Second Law based on experimental data on lifting the dhadak merak mask from Reyog Ponorogo and the bachelor ganong mask. In addition, students are also invited to evaluate the direction of acceleration in the activity of pushing objects.

In the third indicator, namely interpreting data and scientific evidence, there was an increase from an average score of 50 to 60. This indicator presents a descriptive story related to the uniqueness of the dhadak merak dance which is able to lift the dhadak peacock with the strength of its teeth. At this stage students are asked to explain the concept of Newton's Second Law that works on the dhadak peacock dancer. In addition, a descriptive illustration is also presented regarding the action of the dhadak peacock mask on the player's head. At this stage students are asked to interpret the data and provide proof of concept of Newton's Third Law based on the illustration provided.

Local culture-based learning has proven to be effective in learning science in schools (Anisa, 2017; Atmojo et al., 2021; Dewi et al., 2017; Fuadati & Wilujeng, 2019). This happens because in the local culture-based learning process it is not just transferring culture or cultural manifestations, but also using culture to make students create meaning, penetrate the boundaries of

imagination, and creativity to achieve a deep understanding of the material and concepts being studied by students (Atmojo et al., 2021).

Science learning based on the local culture of the dhadak merak dance in Reyog Ponorogo is proven to be able to increase the scientific literacy of class VII D students at SMP Negeri 3 Depok, Sleman, Yogyakarta. The increase in students' scientific literacy skills still does not meet the expected Minimum Completeness Criteria, this can be due to the implementation being carried out in only one meeting, so that students cannot fully understand the material related to Force and Newton's Laws delivered.

Conclusion

Learning Science Based on Local Culture Dhadak Merak Dance Reyog Ponorogo is proven to significantly increase students' scientific literacy. The results of the analysis show: (1) there is an increase in students' scientific literacy through learning science based on the local culture of the Dhadak Merak Reyog Ponorogo dance as indicated by the sig (2-tailed) value of 0.001 <α (0.05); (2) The average scientific literacy ability of students at the posttest (57.47) is higher than the average literacy ability of students during the pretest (44.12).

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