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Research Article

The Profile of Students' Science Process Skills on Heat and Its Transfer Content Using an Ethnoscience Approach (Uha Food Making in Liang Village, Central Maluku)

Elsina Sarah Tamaela*, Cicylia T. Kereh, Asry N. Latupeirissa, Ledy Manuhuttu, and Mariana S. Sahetapy

Physics Education Study Program, Faculty of Teacher Training and Education, Pattimura University Ambon - Indonesia

ORCID

Elsina Sarah Tamaela: https://orcid.org/0009-0009-6671-9038

Abstract.
Physics learning can be carried out by involving cultural elements in it. One approach that can be used is ethnoscience—an integrated physics learning with the culture of making the typical food of the Liang Village Community in Central Maluku Regency, namely Uha. The production process of Uha can be used to teach the concept of heat and its transfer and also to train science process skills to students. This research involved 23 students who were residents of Liang Village. The instrument for data collection was a set of 13 science process skills test questions. Students' worksheets were analyzed descriptively. Based on the analysis results, each process skill indicator were found to be poor. Thus, it can be concluded that the students' science process skills still need to be trained in an integrated manner in physics learning activities in the classroom.

Keywords: science process skills, ethnoscience

Corresponding Author: Elsina Sarah Tamaela; email: elsatamaela1977@gmail.com

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1. Introduction

Understanding concept and process skills are two critical elements of physics learning in the Merdeka Curriculum components. These two components support each other. Physics, which is a part of the Natural Sciences, requires a learning process through experience. Experience in building concepts can be obtained through figuring out and doing activities [1, 2]. These activities, by using scientific methods, will help learners develop their understanding of concepts [3]. This process can be internalized by students through Science Process Skills (SPS). SPS is the ability of students to use scientific work or scientific methods to understand a phenomenon, develop science, and seek and find new knowledge through activities [4, 5]. Therefore, SPS becomes an integral part of physics learning, which aims to help learners build concepts and have the proper understanding and become a “gear” in the discovery of facts and concepts development as well as the growth of attitudes, insights, and values [6].

SPS are grouped into two parts, namely primary and integrated [7, 8]. Basic process skills include observing, inferring, measuring, communicating, classifying, and predicting [9]. Meanwhile, the integrated SPS consists of controlling variables, defining operational variables, formulating problems and hypotheses, compiling tables, drawing graphs, formulating mathematical models, interpreting data, and conducting experiments [10, 11]. Integrated SPS has a much higher level of difficulty than basic SPS.

Abstract physics concepts will be more accessible to understand when learning is carried out through experimenting and contextual activities. The experimental process is managed by involving the daily activities of students so that it is easier to understand because of the connectivity that occurs. Contextual learning encourages teachers to choose and design learning environments that allow them to relate various forms of social, cultural, physical, and psychological experiences in achieving learning outcomes [12]. Because of its real nature and encountered in everyday life, it is easily understood by students [13]. In creating a natural learning environment and in direct contact with the lives of students, one approach that can be integrated is ethnoscience.

Ethnoscience is the knowledge that is unique to a nation, group or tribe and is in the form of local wisdom [14]. The ethnoscience approach is a strategy for creating learning environments and designing learning experiences that integrate culture as part of the learning process. Learning by integrating ethnoscience will have an impact on character building [15, 16], critical thinking skills, and creativity [17]. SPS can be trained through learning by doing and direct teaching strategies [18]. Through learning by doing, students will learn to relate concepts combined with regional culture so that learning becomes meaningful. The integration of ethnoscience approaches can take the form of ritual culture, a procession, traditional games, or language. The ethnoscience approach, according to [14], can be done by integrating forms of local wisdom into learning. Integrating local wisdom can also be implemented in learning based on the geographical location of the local area and the talents and potentials of children [19].

One form of local wisdom that can be integrated into physics learning is the process of making traditional food for the Liang Village Community, Central Maluku Regency. The food is known as Uha. Uha, which is made from sago (sago mantah, as the Moluccans call it), was initially processed by burning. However, now it can be processed through steaming and roasting. Jepa is the local name for the baked process. The process of making Uha, Jepa, or steaming can be used by teachers to teach the concept of heat and its transfer. The process of making Uha can be used to carry out learning activities through a series of SPS so that an understanding of concepts can be formed. Activities that help real-experience students to develop science through SPS indicators. Direct teaching to train SPS can be done through ethnoscience strategies [18].

2. Materials and Method

This research is descriptive and it aims to provide an overview of the achievements of each SPS indicator trained through the ethnoscience approach (the process of making Uha). The subject research was 23 people in grade XI at a high school in Central Maluku. The instruments used to collect research data were SPS observation sheets and a test of 13 questions. The test was developed by referring to the SPS indicators, such as formulating problems and hypotheses, defining variables operationally, compiling tables, drawing graphs, formulating mathematical models, interpreting data, conducting experiments, and concluding experimental results. The instruments that have been developed and validated by the team and declared suitable for use in collecting data. The collected data was analyzed descriptively to answer the purpose of this study. A descriptive analysis is performed for each SPS indicator trained.

3. Results and Discussion

In this study, the results of SPS analysis will be explained through an ethnoscience approach. The ethnoscience approach used in this study is the making of traditional food (Uha) by the Liang Village community in Central Maluku. This traditional food was known initially as Uha bakar, but over time experienced innovative developments in the process so that it became Uha roasted (Jepa) and Uha Steamed. Data on SPS achievement analysis for each indicator can be seen in Table 1.

Table 1 explains the qualification of students' achievements of ten SPS indicators measured in two meetings. The qualification of the indicator “formulating the problem” at the first meeting is fair with the number of 23 people or 100% of the total students. Furthermore, at the second meeting, there were 10 people, or 43.47%, with “fair” qualifications and 13 people, or 56.52%, with poor qualifications. The qualification of the indicator “formulating a hypothesis” at the first meeting is “fair” in the amount of 23 people or 100%. In the second meeting, there were 8 people, or 34.78%, with “fair” qualifications and 15 people, or 65.21%, with “poor” qualifications. Then the indicator “identifying variable” at the first meeting was “fair” with 23 people or 100%, while at the second meeting, it could not be assessed since students did not do it. Students do this because they already understand the investigation steps, which are the local wisdom of the local area. On the indicator “formulating operational variables” the qualification for both meetings is “very poor” with the same number of 23 people or 100%. The indicators “designing investigations” and “making tables” had the same qualification at both meetings, namely “excellent” with 23 people or 100%.

Furthermore, the qualification on the indicator “making a graph” at the first meeting was “excellent” with a total of 23 people or 100%. However, at the second meeting, this indicator could not be assessed since students did not do it. For learners, this indicator is considered very difficult to finish. The same is true of the “making mathematical models” indicator, which cannot be assessed at the first and second meetings because it is not done. Students were not used to being trained to make mathematical models so it is categorized as complicated. The indicator “analyzing the results of the investigation” at the first meeting was spread over three qualifications, namely “excellent” as many as 11 people or 47.82%, “fair” as many as 7 people or 30.43% and “very poor” as many as 5 people or 21.73%. The second meeting was spread over four qualifications, namely “good” as many as 12 people or 52.17%, “fair” as many as 3 people or 13.04%, “poor” as many as 1 person or 4.34% and “very poor” as many as 6 people or 26.08%. Finally, on the indicator “formulating conclusions,” the qualification cannot be assessed because learners do not do it.

Overall, the recapitulation of students’ SPS achievements can be read in Table 2. The table shows that the students were excellent in three SPS indicators at the first meeting, such as identifying variables, designing investigations, and creating tables. They were good at analyzing the results of investigations, fair at formulating problems and hypotheses, and very poor at four indicators, i.e., formulating operational variables, making mathematical models, making graphs, and making conclusions. At the second meeting, they were very good at designing investigations, fair at analyzing the results of investigations, poor at formulating problems and hypotheses, and inferior at the four other indicators. Those indicators are the same as the first meeting. Thus, it can be said that the four indicators have not changed although they have attended the learning process with the ethnoscience approach. Based on the results of this analysis, shows that students still need guidance to train their SPSs.

The results of the analysis in Table 2 are shown visually in Figure 1. The picture shows indicators that have not changed even though the students have shown up in the class. Some indicators are not raised at the second meeting because they are a continuation of the work from the first meeting. The following results of the MCC profile analysis are shown in Figure 1 below.

Table 1: The Qualification of Students Science Process Skills Based on the Indicators.

Indicators	Meetings	Qualifications				
		Excellent	Good	Fair	Poor	Very Poor
Formulating problems	1	0	0	100	0	0
	2	0	0	43,0	56,0	0
Formulating hypotheses	1	0	0	100	0	0
	2	0	0	34,7	65,2	0
Variable Identification	1	0	0	100	0	0
	2	0	0	0	0	100
Formulating operational variable	1	0	0	0	0	100
	2	0	0	0	0	100
Designing investigation	1	100	0	0	0	0
	2	100	0	0	0	0
Drawing table	1	100	0	0	0	0
	2	100	0	0	0	0
Drawing graph	1	100	0	0	0	0
	2	0	0	0	0	100
Mathematics model	1	0	0	0	0	100
	2	0	0	0	0	100
Analyzing the results	1	47,82	0	30,43	0	21,73
	2	0	52,20	13,0	4,34	26,10
Making conclusion	1	0	0	0	0	100
	2	0	0	0	0	100

Science Process Skills (SPS) are the basis for thinking and working scientifically [20] and are known as procedural skills [21]. Science process skills also form a person's way of thinking to obtain information scientifically and responsibly. Science process skills are not only needed during learning activities but in everyday life to solve problems. Thus, to prepare human resources to have problem-solving skills, it is highly recommended to integrate SPS in learning [22]. Integrated SPS requires good basic knowledge so that it can be used for problem-solving [23]. SPS integration can be done through a series of activities involving culture or ethnoscience. Ethnoscience is defined as knowledge that deals with local perceptions of local communities, practices, skills, and ideas, as well as underlying cosmology in the context of socio-economic development processes [24]. Ethnoscience is a form of approach to learning that can be used to help teachers explain concepts. Therefore, the integration of ethnoscience emphasizes the use of

Table 2: Recapitulation of Students' SPS Achievements.

Indicator SPS	First Meeting		Second Meeting	
	Score	Qualification	Score	Qualification
Formulating Problems	50,00	Fair	30,87	Poor
Formulating Hypoteses	50,00	Fair	27,83	Poor
Variable identification	100,00	Excellent	-	-
Formulating Operational Variables	0,00	Very Poor	0,00	Very Poor
Creating Mathematical Models	0,00	Very Poor	0,00	Very Poor
Designing Investigations	100,00	Excellent	100,00	Excellent
Create a Table	100,00	Excellent	-	-
Creating Charts	0,00	Very Poor	10,87	Very Poor
Analyzing Investigation Results	68,12	Good	45,51	Fair
Making Conclusions	-	Very Poor	-	Very Poor

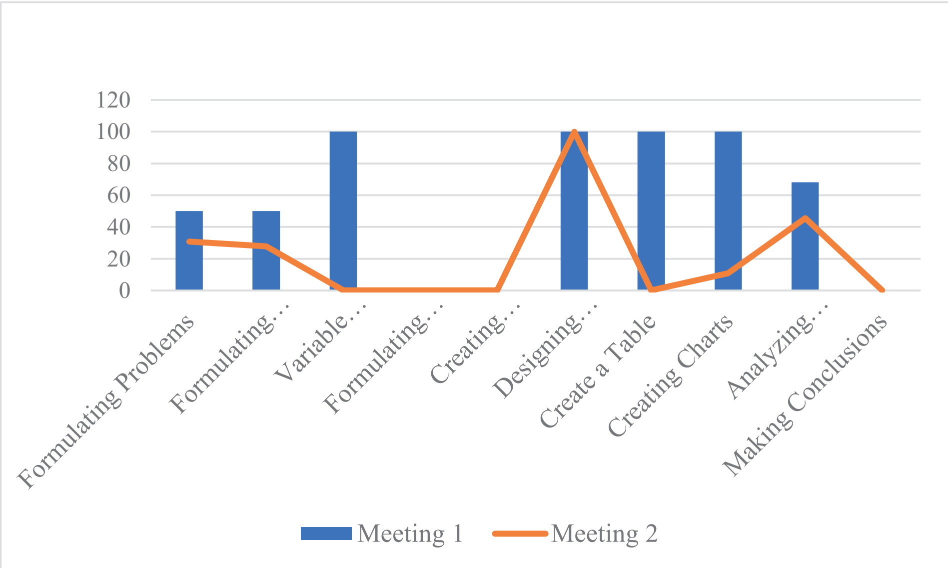

Figure 1: Average Science Process Skills Profile.

environmental concepts and local culture as learning resources. One of the traditional food-making cultures in Liang Village, Uha, can be used to teach the concept of heat and its transfer through SPS activities.

In Table 1, it can be seen that in the first meeting, the students mostly mastered 4 indicators, such as variable identification, designing experiments, compiling tables, and drawing graphs. However, only designing investigation remained at the second meeting. On the contrary, most students were in the inferior category in formulating operational variables, making mathematical models, and making conclusions. In the part of making conclusions, most students did not answer the question because the class hours had ended. These research findings show that the achievement of SPS indicators varies and tends to be at a poor level. This is due to teachers who are not used to integrating SPS into the learning process. SPS has become something new, so students have difficulty in to follow the learning process. Meanwhile, learning physics with a cultural approach to making Uha is new for students. However, it becomes fun because practicum activities provide direct experience and are part of their daily lives, so students become more enthusiastic about learning. The enthusiasm that arises proved that learning physics using the ethnoscience approach of Liang Village Community has made learning meaningful [25].

Based on the analysis, it is shown that the indicator “design an investigation” reaches the maximum value (100) at the first and second meeting, while the indicators “identifying variables” and “creating tables” also reach maximum values at the first meeting. The success of learners for these three indicators was due to the initial concepts they have had through the Uha-making culture. This finding supports the opinion of [26] which states that initial knowledge is formed from local culture and has become part of students’ daily lives. However, at the second meeting, the indicator identifies variables and makes the table decrease. This is because learners focus more on the indicators of designing investigations rather than these two indicators. It happens due to the confidence that arises from having recognized concepts before. The happy reaction raised by students, according to [26], was a response to the knowledge that students have had before so that learning becomes meaningful. The students could not finish making the table because they took a long time to investigate the second meeting. The period time of physics learning provided by the school was not enough. The time constraint also prevented the students from concluding the two meetings. Another obstacle that was found, some students were playing during the research. They needed to be supervised by the teacher. These constraints are in line with the research findings of [26]. Based on the findings, teachers must be able to design learning steps and have good class management so that time constraints can be minimized.

In this research, the indicators formulate operational variables and create mathematical models were in very poor qualification at both the first and second meetings. These two indicators are considered problematic by students because they do not know how to formulate operational variables. Their teachers never integrated SPS into learning so it becomes new for the students. The ability of the students to make mathematical models is inferior due to their teachers directly writing mathematical models without giving explanations. Making a mathematical model is the ability to translate problems from the real world to mathematical problems using symbols and operations in mathematics [27]. It means the students cannot translate problems about the concept of heat and its transfer to the process of making Uha using mathematical symbols and operations. When students fail to make mathematical models, according to [28] it will result in errors in making graphs and conclusions. This result is in line with the research findings on indicators, making graphs and conclusions. The poor ability to make mathematical models is a representation of students' weak understanding of concepts in translating story problems about heat and its transfer. This correlates with the student's understanding of the concept. The high and poor SPS of the students also depend on their attitude toward science. If the students' attitude towards science is positive, it will have a good impact on the results, but vice versa if it is negative.

SPS is an essential element that must be trained at all times in physics learning because it will have an impact on the students' way of thinking and their problem-solving process. SPS can be trained with contextual learning, and it can be obtained from an ethnoscience approach. One of the findings in the study was the lack of teacher knowledge in planning, implementing, and evaluating ethnoscience approaches. This is also due to the difficulty of teachers to associate teaching materials with integrated cultures.

4. Conclusion

The cultural ethnoscience of making Uha can be integrated to teach the concept of heat and its transfer. In addition, ethnoscience can be a learning resource to train science process skills to students. The SPS of grade XI students at a state high school in Central Maluku is still relatively poor. Therefore, teachers need to integrate ethnoscience into physics learning so that it will make a positive impact on the ability of students.

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