Science Process Skills and Gawi Sabarataan Character of Students: Effectiveness of Local Wisdom-Based Physics Teaching Modules

Mastuang[1], Dewi Dewantara[2], Risma Putri Ramadhany[3], Sri Hartini[4]

{mastuang_pfis@ulm.ac.id[1], dewantara_pfis@ulm.ac.id[2], rismaprfisika@gmail.com[3], srihartini_pfis@ulm.ac.id[4]}

Physics Education Study Program, Faculty of Teacher Training and Education, Universitas Lambung Mangkurat, Banjarmasin, Indonesia

Abstract. This article aims to describe the effectiveness of local wisdom-based physics teaching modules in improving science process skills and gawi sabarataan character. The subjects of the trial were 32 students of class XI IA-4 of SMA Negeri 4 Banjarbaru. Data collection techniques used science process skills tests for effectiveness, science process skills assessment sheets for students' achievement of science process skills, and character observation sheets for students' achievement of gawi sabarataan character. The results of the study showed that the science process skills test obtained a moderate category, the achievement of science process skills obtained a fairly good category, and the achievement of gawi sabarataan character obtained a very good category. Based on these results, it can be concluded that local wisdom-based physics teaching modules can be used to train students' science process skills and gawi sabarataan character in physics learning at school.

Keywords: Local Wisdom, Physics Teaching, Science Process

1 Introduction

Science process skills are the development of physical and mental skills resulting from the basic skills possessed by a person [1]. Science process skills can also be interpreted as scientific skills related to how to obtain information and how a person thinks when formulating concepts, facts, principles, and laws related to scientific objects and events [2], [3], [4], [5]. Science process skills can encourage students to think objectively, analytically, and critically in viewing something, where these skills can be used as a basis for interaction in everyday life [6], [7], [8]. In physics learning, it is often associated with science process skills. This happens because in physics learning, these skills are very important to use to develop scientific attitudes in students[9], [10], [11], [12]. Science process skills include the ability to observe, design experiments, collect data, analyze information, and make decisions based on scientific evidence [13], [14], [15]. This ability plays a role in developing critical thinking skills, helping students analyze problems, build strong arguments, and

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make the right decisions. In addition, the use of skills related to the science process also contributes to encouraging creativity and innovation in learning in schools with an independent curriculum [16].

Some solutions that can be used to overcome the above problems are by conducting several studies that have been developed in the Physics Education Study Program at Lambung Mangkurat University. There are still not many developments of physics teaching modules using the independent curriculum to train science process skills using the project learning approach. The teaching modules that are made, educators can adjust to the needs of students such as carrying out practical activities to find concepts, principles, or laws of physics. One example of physics material that is close to everyday life is temperature and heat. In this material, there is still not much research related to local wisdom-based project learning on temperature and heat material. Through temperature and heat material, students are required to be able to apply the concepts and principles of temperature and heat in a product resulting from project learning as a demand of the independent curriculum. In addition, based on local wisdom, students will easily understand the concept of temperature and heat that occurs in the environment around the students.

Local wisdom is part of a society's culture and cannot be separated [17], [18]. Local wisdom is often passed down from generation to generation by word of mouth. Integrating elements of local wisdom into learning activities can bring significant benefits by enriching students' learning experiences, developing students' skills and helping students become more involved individuals, more connected to their environment and culture [19], [20], [21]. By linking local wisdom in learning, students will experience more meaningful learning because the context taught is close to the students. The importance of including local wisdom in teaching modules not only provides additional insight into traditions and cultural values but also helps students develop a sense of pride in their own cultural roots [22], [23], [24], [25], [26], [27], [28], [29]. Thus, it not only enriches students' knowledge of local culture but also helps build a strong sense of identity and preserves cultural heritage. The local wisdom contained in the teaching module is in the form of kalalapun cakes which are often found in Banjar Regency, precisely in Martapura City. The reason for choosing Kalalapun cake as local wisdom is because Banjarbaru City is still close to Martapura City, so students are certainly familiar with Kalalapun cake which is usually sold in Martapura City.

The character of students that can be improved through a project learning approach to train students' science process skills based on local wisdom is "Gawi Sabarataan". "Gawi Sabarataan" is the motto of Banjarbaru City, South Kalimantan Province. Literally, "Gawi Sabarataan" can be interpreted as an activity carried out together or by working together[30]. In the Pancasila student profile, mutual cooperation means that students have the ability to work together, namely the ability to work together voluntarily so that the activity can run smoothly, easily and quickly. The core element in the Pancasila student profile is the use of the principle of mutual cooperation which includes cooperation between fellow students, cooperation in constructive fields with an attitude of helping and supporting each other, and having concern as a key attitude to encourage each other. cooperative behavior. In addition, it is important for students to learn to share, because this is a noble behavior and is able to realize the principle of mutual cooperation in the Pancasila student profile[31]. This article aims to describe the effectiveness of local wisdom-based physics teaching modules in improving science process skills and the character of Gawi sabarataan.

2 Method

The subjects of this research trial were grade XI students at high schools in Banjarbaru city. The research was conducted in the even semester of 2024. The science process skills test was measured by calculating the normalized gain or normalized gain score. Normalized gain can be calculated using the following equation. The achievement of students' science process skills is seen from the results of the student's worksheets. The indicators of science process skills observed in this study were formulating problems, formulating hypotheses, identifying variables, defining variables operationally, analyzing data, and making conclusions. The data on the achievement of science process skills were adjusted using the following science process skills assessment criteria.

Table 1. Criteria for Achieving Science Process Skills [32]

No.	Interval	Category
1.	$X > 3.2$	Very Good
2.	$2.8 < X \leq 3.2$	Good
3.	$2.2 < X \leq 2.8$	Enough
4.	$1.6 < X \leq 2.2$	Less
5.	$X \leq 1,6$	Not Good

2.1 Character Value of *Gawi Sabarataan*

The assessment of the students' gawi sabarataan or mutual cooperation character is carried out by considering the elements of mutual cooperation. The average score results based on observations of mutual cooperation character are adapted to suit the character achievement criteria listed in the following table.

Table 2. Character Assessment Criteria for Gawi Sabarataan

No.	**Interval**	**Category**
1.	$X \geq 3.4$	Very Good
2.	$2.8 < X \leq 3.4$	Good
3.	$2.2 < X \leq 2.8$	Enough
4.	$1.6 < X \leq 2.2$	Less
5.	$X \leq 1.6$	Not Good

3 Results and Discussion

The effectiveness of the teaching module was measured using cognitive learning outcome tests and science process skills tests in the pre-test and post-test containing 6 indicators of science process

skills. The trial sample in this study was 35 students of class XI IA 4 SMA in Banjarbaru city. However, in this study, the researcher only used 32 students as trial samples. The cognitive learning outcome tests distributed to students amounted to 6 numbers. The n-gain score acquisition on the cognitive learning outcome test of students was calculated using the N-gain score formula [33] and the N-gain category as in Table 3.

Table 3. Results of Calculating the Effectiveness of Cognitive Learning Outcome Tests

Average of *pre-test*	Average of *post-test*	*N-gain*	Category
23.14	55.35	0,42	Average

Based on Table 3, it can be seen that there is an increase in students' cognitive learning outcomes before and after using the developed teaching module. This is reinforced by the acquisition of n-gain values in the moderate category, so it can be said that the developed teaching module is effective for the learning process. In addition to the cognitive learning outcome test, there is also a science process skills test that contains 6 indicators of science process skills, including formulating problems, formulating hypotheses, identifying variables, defining operational variables, analyzing data, and making conclusions. The science process skills test given to students consists of 3 numbers with each number containing 2 questions. The results obtained can be seen in table 4.

Tabel 4. Results of the Science Process Skills Test

Average of *pre-test*	Average of *post-test*	*N-gain*	Category
1.21	33.51	0.33	Average

Based on Table 4, it can be seen that the average pre-test obtained by students is very poor and indicates that students' science process skills are still low. The average post-test value obtained has been good so that it can be seen that students' science process skills have increased. This is reinforced by the acquisition of n-gain values with a moderate category, so it can be said that the developed teaching module is effective for the learning process. The pre-test and post-test of each indicator of science process skills and n-gain of science process skills are shown in Table 5.

Table 5. Analysis of Science Process Skills Indicators and N-Gain of Science Process Skills

No	Indicator of science process skills	Pre-Test	Post-Test	N-Gain Score	Category
1	Formulate the problem	0	54.17	0.54	Average
2	Formulate the hypothesis	0	24.22	0.24	Low
3	Identify the variables	0	36.98	0.37	Average
4	Define the operational variables	0	12.50	0.13	Low
5	Analyze the data	0	12.11	0.12	Low
6	Make a conclusion	12.50	75	0.71	High

Table 5 shows the results of the analysis of science process skills indicators and n-gain of science process skills. These results indicate that the level of science process skills of students is still low. In the indicator of formulating problems, the n-gain value is 0.54 with a medium category.

Then, in the indicator of formulating hypotheses, the n-gain value is 0.24 with a low category. Then, in the indicator of identifying variables, the n-gain value is 0.37 with a medium category. Furthermore, in the indicator of defining operational variables, the n-gain value is 0.13 with a low category. Then, in the indicator of analyzing data, the n-gain value is 0.12 with a low category. Finally, in the indicator of making conclusions, the n-gain value is 0.71 with a high category. Based on the n-gain value of each indicator of science process skills, there are 3 indicators that are categorized as low, it can be said to be ineffective. However, overall, the average n-gain of science process skills is 0.33 with a medium category. Based on these results, it can be said that the local wisdom-based physics teaching module can be used to train students' science process skills and patience character.

3.1 Achievement of Science Process Skills

The achievement of students' science process skills is measured through student worksheets given at each meeting and assessed through KPS assessment sheets carried out by three observers. There are 6 student worksheets given during 4 meetings on the topic of temperature and heat, namely student worksheet 1-A Expansion of Solids, student worksheet 1-B Expansion of Liquids, student worksheet 1-C Expansion of Gases, student worksheet 2 Heat, student worksheet 3 Black's Principle, and student worksheet Wadai Kalalapun Project. The achievement of these science process skills also determines how the developed student worksheets can train students' science process skills. The table of results of students' achievement of science process skills is presented in Table 6.

Table 6. Results of Students' Achievement of Science Process Skills

Group	Meet- 1		Meet- 2		Meet- 3		Meet- 4	
	Average	**Category**	**Average**	**Category**	**Average**	**Category**	**Average**	**Category**
1	2.50	Enough	2.75	Good	3.00	Good	3.08	Good
2	2.08	Less	3.00	Good	3.00	Good	3.16	Good
3	2.58	Enough	3.08	Good	2.83	Good	3.16	Good
4	1.75	Less	2.5	Enough	3.08	Good	3.41	Good
5	1.91	Less	3.00	Good	2.83	Good	3.16	Good
6	2.25	Enough	2.83	Good	2.91	Good	3.16	Good
7	1.91	Less	2.50	Enough	2.75	Enough	3.00	Good
Average	2.14	Less	2.80	Good	2.91	Good	3.16	Good
Overall average					**2.75**			
Category					**Enough**			

Table 7. Results of Students' Achievement of Science Process Skills Per Indicator

Indicator	Meet- 1		Meet- 2		Meet- 3		Meet- 4	
	Average	**Category**	**Average**	**Category**	**Average**	**Category**	**Average**	**Category**
Formulate the problem	3.35	Very good	4.00	Very good	3.78	Very good	4.00	Very good

Formulate the hypothesis	2.85	Good	3.92	Very good	3.42	Very good	3.78	Very good
Identify the variables	2.57	Enough	2.71	Good	3.00	Good	3.00	Good
Define the operational variables	0.42	Not Good	1.64	Less	2.28	Enough	2.50	Enough
Analyze the data	1.42	Not Good	2.14	Less	2.28	Enough	2.57	Enough
Make a conclusion	2.21	Enough	2.42	Enough	2.71	Enough	3.14	Good
Average	2.14	Less	2.80	Good	2.91	Good	3.16	Good

Science process skills are trained for students at each meeting by conducting experiments and completing student worksheets which are measured through science process skills assessment sheets carried out by observers with the aim of knowing the science process skills achieved by students. The indicators measured include formulating problems, formulating hypotheses, identifying variables, defining operational variables, analyzing data, and making conclusions. Students are divided into 7 groups with each group consisting of 5 students. At the first meeting (student worksheet 1-A, student worksheet 1-B, and student worksheet 1-C) the experiment on the expansion of substances can be seen in Table 5, the achievement of KPS for each group. The average achievement of science process skills at the first meeting was 2.41 with a category of less than good. The indicator for formulating problems has been categorized as very good, where the formulation of problems that have been made by students has met the assessment criteria for this indicator. Then, the indicator for formulating hypotheses has been categorized as good, where the hypotheses that have been made by students meet the assessment criteria for this indicator, but there are still several groups that still have difficulty in formulating hypotheses. Then, in the indicator of identifying variables, it is categorized as not good, where students are still not careful in identifying what variables have an influence on the experiment to be carried out. Furthermore, in the category of defining operational variables and analyzing data, it is categorized as not good, where in the indicator of defining operational variables, students only define or write the meaning of the related variables without explaining how the variables are manipulated or controlled, how the variables are measured, and what units are used for the variables. While in the indicator of analyzing data, students only rewrite their hypothesis formulation, without linking it to the theory of expansion of substances and the relationship between manipulated variables and response variables. Finally, in the indicator of making conclusions, it is categorized as quite good, where students still have difficulty in concluding the data obtained. Overall, students have never been trained in science process skills, so that at the first meeting the achievement of students' science process skills is categorized as not good. In addition, students also feel burdened because students are only given student worksheets for the first time containing 6 indicators of science process skills. At the second meeting (student worksheet 2) the heat experiment can be seen in Table 4.8 the achievement of science process skills for each group. The average achievement of science process skills at the second meeting was 2.80 with a good category. In the problem formulation indicator, it has been categorized as very good, where the problem formulation that has been made by students has met the assessment criteria for

this indicator. Then, in the hypothesis formulation indicator, it has been categorized as very good, where the hypothesis that has been made by students meets the assessment criteria for this indicator. Then, in the variable identification indicator, it is categorized as quite good, where students have been able to identify what variables have an effect on the experiment to be carried out, but in the control variable, students have not yet completely identified the variables that have an effect on the experiment. Furthermore, in the category of defining operational variables and analyzing data, it is categorized as less good, where in the variable definition operational indicator, students have been able to define or write the meaning of the related variables and write down what the variables are measured with, but students have not been able to explain how the variables are involved in the experiment and their units. Meanwhile, in the data analysis indicator, students have been able to rewrite their hypothesis formulation and relate it to the heat theory, but students have not been able to connect the manipulation variables with the response variables. Finally, in the conclusion making indicator, it is categorized as quite good, where some students still have difficulty in concluding the data obtained.

At the third meeting (student worksheet 3) the Black principle experiment can be seen in Table 5 the achievement of science process skills for each group. The average achievement of science process skills at the third meeting was 2.92 with a good category. In the problem formulation indicator, it has been categorized as very good, where the problem formulation that has been made by students has met the assessment criteria for this indicator. Then, in the hypothesis formulation indicator, it has been categorized as very good, where the hypothesis that has been made by students meets the assessment criteria for this indicator. Then, in the variable identification indicator, it is categorized as good, where students have been able to identify what variables have an effect on the experiment to be carried out and several groups have been able to identify control variables completely, but there are still several groups who have not completely identified the control variables that have an effect on the experiment. Furthermore, in the category of defining operational variables and analyzing data, it is categorized as quite good, where in the variable operational definition indicator, students have been able to define or write the meaning of the related variables and write with what measuring instrument the variables are measured, but students have not been able to explain how the variables are involved in the experiment and their units. Meanwhile, in the data analysis indicator, students have been able to rewrite their hypothesis formulation and relate it to Black's principle theory, but students have not been able to connect the manipulation variables with the response variables. Finally, in the conclusion making indicator, it is categorized as good, where students have been able to make conclusions by answering the problem formulation or by rewriting the hypothesis that has been formulated. At the fourth meeting (student worksheet Project) making containers in the sub-topic of heat transfer can be seen in Table 5 the achievement of science process skills for each group. The average achievement of science process skills at the fourth meeting was 3.17 with a good category. In the problem formulation indicator, it has been categorized as very good, where the problem formulation that has been made by students has met the assessment criteria for this indicator. Then, in the hypothesis formulation indicator, it has been categorized as very good, where the hypothesis that has been made by students meets the assessment criteria for this indicator. Then, in the variable identification indicator, it is categorized as good, where students have been able to identify what variables have an influence on the experiment to be carried out and several groups have been able to identify the control variables completely, but there are still several groups who have not completely identified the control variables that have an influence on the

experiment. Furthermore, in the category of defining operational variables and analyzing data, it is categorized as quite good, where in the variable identification indicator, students have been able to define or write the meaning of the related variables and write down what measuring instruments the variables are measured with. Several groups have also been able to explain the involvement of the variables in the experiment and mention the units of the variables being measured, but students have not been able to explain how the variables are involved in the experiment and their units. While in the data analysis indicator, students have been able to rewrite their hypothesis formulation and relate it to the theory of heat transfer, expansion of matter, and heat, but students who only relate the results of the experiment to the theory of heat transfer. Finally, in the conclusion making indicator, it is categorized as good, where students have been able to make conclusions by answering the problem formulation or by rewriting the hypothesis that has been formulated. Overall, the achievement of students' science process skills has increased. Each group experienced an increase in science process skills at each meeting.

3.2 Gawi Sabarataan Character Achievement

The achievement of the Gawi sabarataan character of students was measured through an observation sheet filled out by three observers. The table of observation results for the achievement of the Gawi sabarataan character of students is presented in Table 8.

Table 8. Results of the Achievement of the Gawi Sabarataan Character of Students

Group	Meet- 1		Meet- 2		Meet- 3		Meet- 4	
	Average	**Category**	**Average**	**Category**	**Average**	**Category**	**Average**	**Category**
1	3.50	very good	3.66	very good	3.58	very good	3.66	very good
2	3.41	very good	3.58	very good	3.50	very good	3.50	very good
3	3.50	very good	3.58	very good	3.58	very good	3.58	very good
4	3.33	good	3.50	very good	3.41	very good	3.50	very good
5	3.58	very good	3.66	very good	3.66	very good	3.66	very good
6	3.50	very good	3.58	very good	3.58	very good	3.58	very good
7	3.33	good	3.50	very good	3.41	very good	3.50	very good
Average	3.45	very good	3.58	very good	3.53	very good	3.57	very good
Overall average					**3.53**			
Category					**very good**			

Based on Table 8, it can be seen that the achievement of the Gawi sabarataan character of students increased at each meeting. At the first meeting, the character achievement was 3.45 with a very good category. At the second meeting, the character achievement was 3.58 with a very good category. At the third meeting, the character achievement was 3.53 with a very good category. At the fourth meeting, the character achievement was 3.57 with a very good category. The overall average achievement of the Gawi sabarataan character of students was 3.53 and was categorized as very good.

The Gawi sabarataan character of students was observed using an observation sheet carried out by 3 observers during the learning process. Observations on the Gawi sabarataan character were reviewed through 6 aspects, where each aspect has different indicators. The indicators for each aspect are, 1) anti-discrimination, 2) anti-violence, 3) cooperation, 4) empathy, 5) consensus, 6) solidarity (31.32).

Based on Table 8, it can be seen that the Gawi sabarataan character of students at each meeting has been categorized as very good. This is because students do not discriminate against ethnicity, race, religion, and culture in group learning. Then, students also do not commit violence or bullying against group members. Then, students have also worked together during the learning process. Furthermore, students do not underestimate or belittle the feelings of group members during the learning process. In addition, students have played an active role in group discussions during learning. Finally, students play an active role in group learning. The classroom is a very good place to build group (team) skills to work together to achieve common goals, so that with the teaching module containing the Gawi sabarataan character, students are expected to be motivated to be able to build group skills to work together. Based on the overall average achievement of the Gawi sabarataan character, a value of 3.53 was obtained with a very good category.

4 Conclusion

The learning outcome test and science process skills test obtained a moderate category. The achievement of students' science process skills as reviewed from the science process skills assessment sheet obtained a fairly good category. The achievement of students' gawi sabarataan character as reviewed from the observation sheet obtained a very good category. Based on these results, it can be concluded that the local wisdom-based physics teaching module can be used to train students' science process skills and gawi sabarataan character in physics learning at school.

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