P-ISSN: 1693-1246
E-ISSN: 2355-3812
December 2023

Jurnal Pendidikan Fisika Indonesia 19 (2) (2023) 136-144
DOI: 10.15294/jpfi.v19i2.39916

http://journal.unnes.ac.id/nju/index.php/jpfi

Physics Concept of High School Students in Northern Bone for Advancing Songkok Recca Production

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Received: 04 September 2023. Accepted: 01 November 2023. Published: 31 December 2023

Abstract

This research aims to determine the physics conceptions of high school students in Northern Bone in developing the production of Songkok Recca using an alternative material, water hyacinth fiber. This qualitative study focuses on a descriptive case, which is the students' perceived lack of conception. The subjects used are four individuals interested in physics and are familiar with the process of making Songkok Recca. The case occurs in the students' school environment, which is also the production site of Songkok Recca. Data collection techniques in this research include observation, interviews, and documentation. The research data is analyzed through several stages, namely data collection, reduction, presentation, and data verification. Based on the research findings and discussions, it can be concluded that the students lack physics conceptions. They are only able to express some physics concepts, while some students are not familiar with those concepts.Based on the research results, it can be concluded that the students lack physics conceptions. They are only able to express some physics concepts, and some students are not familiar with those concepts. Water hyacinth fiber is deemed suitable as an alternative material for making Songkok Recca based on feasibility tests. The average tensile strength of wet water hyacinth fiber is 20.808,74021 N/m^2, while the average tensile strength of dry water hyacinth fiber is 841.418,2808 N/m^2.

Keywords: conception, Songkok Recca, water hyacinth fiber

INTRODUCTION

Physics helps improve the scientific understanding of the general public regarding the universe and the physical phenomena that occur around them. By studying physics, people can develop a better understanding of the fundamental principles and laws of nature that underlie everyday events. One of the principles of science literacy based on the national literacy movement is the active and contextual learning approach in physics education. Science literacy is crucial in comprehending and effectively communicating physics concepts (Lubis, 2022).

The National Literacy Movement (GLN) and local wisdom are closely interconnected. In the context of GLN, the introduction and development of science literacy not only encompass understanding scientific concepts and skills but also consider the values and wisdom embedded in local culture. By incorporating local wisdom into science education, GLN can become more relevant and meaningful to the Indonesian society (Rahmat, 2014).

Local wisdom is formed from the physical and emotional closeness of humans to the natural resource environment as well as the occurrence of interactions in a system that produces processes and processes that are interrelated, give each other, and take advantage of one another over a long period of time have given birth to knowledge about natural resources itself (Marfai, 2019). To maintain local wisdom, the local government has a great responsibility, not only to prepare financial support, but also to formulate the technical steps to be taken (Marpaung, 2013). Through schools, the government can make a development plan and education based on local wisdom. Indeed, schools

as education providers are important instruments to maintain and inherit good local wisdom for the lives of students (Setiadi, 2019). This is in accordance with 21st century learning, students are required to have creative thinking skills.

Songkok Recca is one of the local wisdom of South Sulawesi, especially in Bone Regency. Songkok Recca (Songkok to Bone) appeared during the war between Bone and Toraja in 1683. At that time the Bone troops used Songkok Recca as a sign to distinguish between the Bone troops and the Tator troops. Initially called Songkok Recca when the 15th Bone King Arung Palakka attacked Tanah Toraja (Tator) in 1683 and only succeeded in occupying a few villages in the Makale-Rantepao region. The Toraja army fought fiercely against the Arung Palakka troops (Mattudala, 2014).

Songkok Recca is one of the local wisdom of South Sulawesi, especially in Bone Regency which is identical with its black and golden yellow colors. Black has the meaning of masculine, reliable, wisdom, and strength. This color corresponds to the target audience, namely men (adults). The golden yellow color (gold) will be used for the product brand text because this color is one of the colors in the product and also means expensive or luxurious (Mustakim, Aswar, & Nurabdiansyah, 2019). Songkok Recca also has a characteristic in terms of its basic material made of palm fronds. The palm tree is an endangered plant, the palm tree is decreasing every year even if there is no rescue effort, the palm tree will become extinct (Molan, 2016). This type of plant is also not easy to breed and takes a long time to grow back. Then, if the Songkok Recca is developed, the palm tree will become extinct. Therefore, are there other basic ingredients that can be used to make Songkok Recca?

One alternative material used, other than *Lontar* palm fronds, to make Songkok Recca is water hyacinth. This is in line with the research by Febriana& Setiawan (2016), which states that water hyacinth is an environmentally friendly natural fiber, making it a safe material for crafting. Moreover, it has become a business trend in the community.

Utilization of natural resources is explained in Article 33 Paragraph 3 of the 1945 Constitution, namely “Earth, water and natural resources contained therein are controlled by the state and used as much as possible for the prosperity of the people, not controlled and owned by foreigners”. It is also explained in the Qur'an, namely Surah Al-Baqarah: 267 which means “O you who believe, spend (in the way of Allah) part of your good efforts and part of what We remove from the earth for you. And do not choose the bad ones and then spend from them, even though you yourself do not want to take them except by squinting your eyes at them. And know that Allah is Rich, Praiseworthy”. The production of Songkok Recca involves an unwritten scientific literacy. Science provides concepts, formulas, principles, and laws. When these elements are combined, they form wisdom and give rise to technology.

Based on the observations and interviews conducted by the researcher with several high school students in North Bone, it was found that the students were not given examples of concepts found in their surrounding environment but were only provided examples from the textbook. In addition to the observations and interviews, the researcher also explored alternative materials to promote the production of Songkok Recca, specifically by using water hyacinth. The research titled "Physics Concept of High School Students in Northern Bone for Advancing Songkok Recca Production" aims to investigate the physics conceptions of high school students in North Bone in advancing the production of Songkok Recca using water hyacinth as an alternative material. Physics is related to natural and environmental phenomena, and it is important to develop students' environmental awareness. Therefore, the objective of this research is to understand the physics conceptions of high school students in North Bone in advancing the production of Songkok Recca using water hyacinth as an alternative material.

METHOD

This research is a qualitative study of the case study type that focuses on a descriptive case, which is the perceived lack of students' conceptions. This type of case study design is conducted by addressing one case first and then moving on to the next case.

This research takes place at SMAN 16 Bone which is located on Jl. Poros Wajo, Paccing Village, Awangpone District, Bone Regency. This research was conducted in the odd semester of the 2020/2021 academic year. The subjects in this study were students who liked physics subjects and were familiar with making Songkok Recca. The subjects in this study were 4 people taken from 2 people in class XI MIA, and 2 people in class XII MIA SMAN 16 Bone.

In qualitative research, the instrument is a person or human instrument, namely the researcher himself. Data collection techniques in this study used observation, interviews, and documentation techniques.

In this study, researchers conducted direct observations to find facts in the field. Observations made are observations of the potential of local wisdom that students need to know. The local wisdom that was raised was Songkok Recca, then researchers made observations about water hyacinth as an alternative material that can be used to minimize the use of palm fiber.Before conducting direct observations, the researcher tested the feasibility of water hyacinth fiber in the laboratory.

The interview technique used is an unstructured interview. Interviews were conducted to confirm the results of observations of student activities so that the data obtained by the researcher was in accordance with the results of previous observations.

The documentation carried out in this study was during the mentoring process to students about the physics conception of water hyacinth fiber for Songkok Recca material. The documentation is in the form of interview recordings and then reinforced with several documents in the form of lesson plans, Physics Subject Books, and student notebooks.

The data analysis technique used by the author is the theory of Miles and Hubermen which states that activities in qualitative data analysis are carried out interactively and take place continuously until complete, so that the data is saturated. The size of the data saturation is indicated by the absence of new data or information. The following are the stages in data analysis according to the theory of Milles and Hubermen (Sugiyono, 2015).

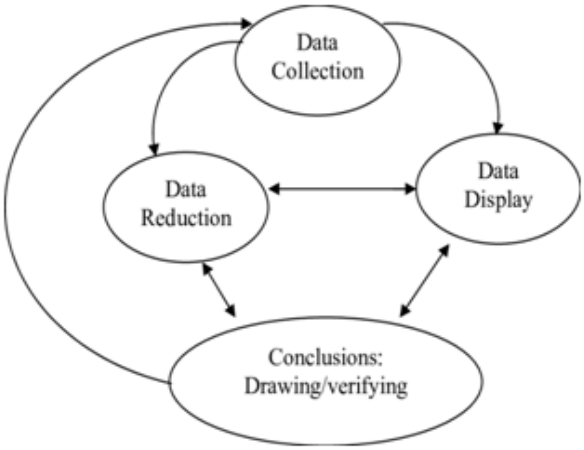

Figure 1. Analysis of qualitative data according to Milles & Huberman

After collecting data by means of observation, interviews, and documentation the next stage is data reduction.In this data reduction stage, the researcher combines and homogenizes the data obtained into one tabular form.Data from students who lack a reduced conception of physics are presented in written form. Then for data verification, conclusions are drawn from the results of presenting the data that has been obtained. At this stage, conclusions are drawn from the results of the presentation of the data that have been obtained.

To ensure the validity of the data obtained in this research, the researcher employed triangulation technique. Triangulation was used to test the credibility of the data by examining data obtained from the same sources using different techniques. By using this technique, the researcher could obtain diverse perspectives and verify the consistency and appropriateness of the data collected from various sources. This increases confidence in the

validity of the data and the conclusions drawn in this research.

RESULT AND DISCUSSION

Table 1 to 9 are the results obtained from each subject:

Questions: 1. There are some fibers in front of you. Which fibers are suitable as an alternative material for Songkok Recca? Why did you choose this fiber?

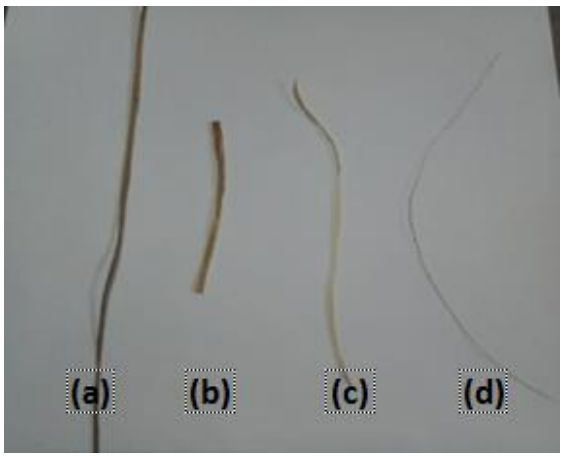

Figure 2. (a) Water hyacinth fiber; (b) Straw fiber; (c) Corn husk fiber; and (d) Banana midrib fiber

Table 1. Student responses regarding question 1

Subject	Argument	Authenticity of Opinion	Argument Category
A	Water hyacinth fiber, because it is not easily broken	Original	Non-Scientific
B	Water hyacinth fiber, because it is not easily break	Original	Non-Scientific
C	Water hyacinth fiber, because it is strong	Original	Non-Scientific
D	Water hyacinth fiber, because it is strong and has voltage	Original	Scientific

From question number one, the four subjects chose water hyacinth fiber as an alternative material for Songkok Recca, on average the subjects answered with the original opinion and the argument category of the D scientific subject while the other subjects with the non-scientific argument category.

Questions: 2. In order to obtain good fiber, the shape of the water hyacinth stems will be selected beforehand. Why do you think shape selection should be done?

Table 2. Student responses regarding question 2

Subject	Argument	Authenticity of Opinion	Argument Category
A	The straight one, so that the resulting fiber is straight	Original	Non-Scientific
B	The one that is small and has no goiter, so that the fibers are straight	Original	Non-Scientific
C	Which is small and does not have too large goiter, because it can affect the resulting fiber	Original	Non-Scientific
D	Long stems, slightly dry and have a hard texture to withstand	Original	Non-Scientific

From question number two, the four subjects chose water hyacinth stems that were long, straight, and did not have a large enough goiter because it would affect the fiber produced, on average the subjects answered with original opinions and categories of non-scientific arguments.

Question: 3. Before obtaining water hyacinth fiber, the most important process is drying. What is the physical explanation for this process?

From question number three, the four subjects have almost the same argument that in the drying process it is influenced by sunlight, on average the subjects answered with original opinions and the categories of arguments of subjects A and B were non-scientific, while subjects C and D were in the category of scientific arguments.

Table 3. Student responses regarding question 3

Subject	Argument	Authenticity of Opinion	Argument Category
A	First big, getting smaller and stronger	Original	Non-Scientific
B	The influence of the sun	Original	Non-Scientific
C	Exposed to sunlight. Drying is sterilization to avoid germs	Original	Scientific
D	The drying process occurs because it requires sunlight whose temperature can be determined at high and low temperatures, the location, and requires a long time	Original	Scientific

Question: 4. How to know the moisture content of water hyacinth that has not dried or that has dried?

Table 4. Student responses regarding question 4

Subject	Argument	Authenticity of Opinion	Argument Category
A	Which looks soft and not easily brittle	Original	Non-Scientific
B	Until the water hyacinth is wrinkled	Original	Non-Scientific
C	By measuring. Measure its weight, if it still has water it will be heavy	Original	Scientific
D	Because initially it was still wet, so the amount of water can be determined using a weighing device	Original	Scientific

From question number four, subjects A and B have arguments in terms of texture and shape of water hyacinth, while subjects C and D have almost the same argument, namely by using measuring instruments. On average, the subjects answered with original opinions and categories of arguments, subjects A and B were non-scientific, while subjects C and D were in the category of scientific arguments.

Question: 5. The dried water hyacinth is separated from other fibers using scissors. What is the physical explanation for this process?

Table 5. Student responses regarding question 5

Subject	Argument	Authenticity of Opinion	Argument Category
A	At the time of cutting the surface area is reduced and when shears water hyacinth there will be pressure	Similar	Scientific
B	Cutting the pressure from the hand to the scissors so that the fiber can be sheared	Similar	Scientific
C	Has a style and includes a simple plane because it has a fulcrum	Similar	Scientific
D	Experiences a reduction in size thus producing a lot of fiber. At the time of cutting the hand force against the scissors then there is an acceleration	Original	Scientific

From question number five, the four subjects have almost the same argument that when cutting they experience a reduction in surface area and there is a pressing force from the hand against the scissors. Subject D answered with the original opinion while the other subjects with a similar opinion and for the argument category the four subjects included in the scientific category.

Questions: 6. Look at this Songkok Recca picture (the researcher will show you Songkok Recca), which part can minimize the use of palm fiber?

Figure 3. Songkok Recca

Table 6. Student responses regarding question 6

Subject	Argument	Authenticity of Opinion	Argument Category
A	The edges because it's easy to weave	Original	Non-Scientific
B	The edges	Original	Non-Scientific
C	Beside	Original	Non-Scientific
D	On the sides because it's easy to wrap and weave	Original	Non-Scientific

From question number six, the four subjects have the same argument that water hyacinth fiber can be applied to the sides or sides of the Songkok Recca because it's easy to weave. On average, the four subjects answered with original opinions and categories of non-scientific arguments.

Question: 7. After determining the part that can minimize the use of palm fiber, then water hyacinth fiber is applied to the Songkok Recca by weaving process. What is the physical explanation for this process?

From question number seven, the four subjects had different arguments regarding the weaving process. Subject C answered with a similar opinion while the other subjects with the original opinion and for the category of argument B, subject B was non-scientific, while the other subjects were in the scientific category.

Table 7. Student responses regarding question 7

Subject	Argument	Authenticity of Opinion	Argument Category
A	Pressure or pressure occurs	Original	Scientific
B	Over time, the frame will be closed following a woven pattern	Original	Non-Scientific
C	Newton's Laws and Forces	Similar	Scientific
D	There is a force on the hand and acceleration when weaving	Original	Scientific

Question: 8. The woven Songkok Recca is then soaked in boiled water from the cashew nut bark for 24 hours. What is the physical explanation for this process?

Table 8. Student responses regarding question 8

Subject	Argument	Authenticity of Opinion	Argument Category
A	Absorbs to produce a black color	Original	Scientific
B	Water hyacinth fiber absorbs the water or dye	Original	Scientific
C	Undergoes precipitation then fermented	Original	Scientific
D	There are styles between Songkok Recca and dyes	Original	Scientific

From question number eight, the four subjects had different arguments regarding the coloring process. On average, the four subjects answered with original opinions and scientific argument categories.Based on the question posed, the researcher expects students to answer the concepts of tensile strength and elasticity, which state that fibers can stretch and return to their original shape after being subjected to pres-

sure or tension when testing the feasibility of using the fiber for Songkok Recca production.

Based on the observation of the feasibility test on water hyacinth stems conducted by researchers at the Basic Physics Laboratory, FMIPA UNM, the measurement results were obtained as seen in Table 9.

Table 9. Water hyacinth stem feasibility test data

Water Hyacinth	Measurement				
	Long (m)	Wide (m)	Mass (kg)	Mass when the sample breaks (kg)	Tensile strength (N/m²)
Wet	0.35	0.0081	0.01069	1.005	3544.97
	0.37	0.00891	0.01535	2.1	6370.01
	0.41	0.00961	0.01333	2.3	5837.42
	0.43	0.0084	0.01581	1.1	3045.40
	0.305	0.001	0.01013	2.6	85245.90
Dry	0.35	0.00069	0.00061	26.379	1092298.14
	0.37	0.00077	0.00082	28.705	1007546.51
	0.41	0.0013	0.00077	29.135	546622.89
	0.43	0.00075	0.00096	26.47	820775.19
	0.305	0.0013	0.00071	29.335	739848.68

Based on the results of the research described above, it is found that students do not have a conception of physics, this can be seen from the answers of these students only able to express the concept of physics and there are also some students who have the wrong concept of the questions given so that it can be said that students the student does not know the concept.This is in line with the research by Bouchée, de Putter-Smits, Thurlings, & Pepin (2022) that states that a majority of students face difficulties in understanding physics concepts, and some students also hold misconceptions.

This is supported by the research of Fariyani & Rusilowati (2015), which states that misconceptions can be deeply rooted in students, leading them to believe that their understanding of concepts is correct. They tend to apply previously held concepts to new ones they encounter. This research highlights the challenge of addressing misconceptions and promoting conceptual change in physics learning.

Furthermore, Madsen, McCullough, & Sayre (2019) also suggests that students' understanding of physics concepts is highly influenced by the learning context provided. A strong understanding of physics concepts requires the integration of different contexts in learning.

The conception referred to in this study is that students are able to describe a concept of an object or an event. The students' conception of physics is not revealed because there are several influencing factors. The factors that cause the conception is not revealed based on the results of observations and research that has been done by the author. The concept of physics that is not revealed can occur because students' understanding of physics quantities is still lacking, this is revealed by the physics teacher of SMAN 16 Bone that there is a lack of understanding of physics units and quantities for students. Based on learning documents in the form of lesson plans, physics subject books, student notebooks, and student assignment books. After observing the physics subject teacher does not provide or discuss examples of concepts in everyday life but only teaches according to physics textbooks in the form of theories and formulas, as well as giving questions or assignments given to students.in the study conducted by Amelia, Elvia, & Handayani (2022), it was revealed that students face difficulties in connecting prior knowledge with new material to be learned. This lack of connection often

leads to the occurrence of preconceptions or initial misconceptions. The research highlights the importance of recognizing and addressing these preconceptions in order to promote accurate understanding and learning of physics concepts.

According to Martawijaya, Rahmadhanningsih, Swandi, Hasyim & Sujiono (2023) based on the analysis results, it was found that using the Ethno-STEM-PjBL model affected the understanding of physics concepts. It was marked by increases in higher-order thinking skills and decreases in misconceptions on several physics topics related to students' activities around Lake Tempe.

Based on the students' answers, it also showed that water hyacinth fiber was feasible as an alternative material for Songkok Recca. This research is in line with Wahyuni's study (2018) where a conceptual overview will be obtained from the analysis of four subjects' answers to interview questions. These answers will be examined for the authenticity of opinions and argumentation categories. Authentic opinions refer to spontaneous responses from the subjects, while similar opinions are responses obtained from multiple sources. The scientific argumentation category pertains to answers that align with physics, while the non-scientific argumentation category includes responses that do not correspond to the principles of physics. According to Wahyuningsih, Raharjo, & Masithoh (2013), some people argue that students' misconceptions of physics concepts are considered normal and can be seen as a failure in the teaching and learning process.

Water hyacinth is categorized as feasible because researchers have conducted a feasibility test and obtained the average tensile strength of wet water hyacinth of 20.808,74021 N/m^2 while the average tensile strength of dry water hyacinth is 841.418,2808 N/m^2. This is evidenced in the research by Pisitsak, Phamonpon, Soontornchatchavet, Sittinun, Ummartyotin, Buajarern, & Inprasit (2019) that water hyacinth fiber has a low tensile strength, but a significantly higher tensile modulus value. the results of the tensile test studied by Yudo and Kiryanto (2012) show that the tensile strength of water hyacinth fiber has large values so that water hyacinth fiber is suitable as a substitute for palm fiber. According to Khotimah (2018), an increase in the percentage of water hyacinth volume fraction significantly affects its tensile and flexural strength. The higher the volume fraction of the fiber, the higher the values of tensile strength and flexural strength. Based on these three opinions, it can be concluded that water hyacinth fiber is a suitable alternative material to lontar palm fiber in the production of Songkok Recca.

The view of students on water hyacinth as a weed can also be changed to be useful. Wisdom in this case Songkok Recca using water hyacinth fiber as an alternative material can help educators to introduce the concept of physics and give birth to a contextual conception of physics in the students' environment so that students can directly observe physics events.

CONCLUSION

Based on the research findings and discussion in the previous chapter, it can be concluded that the students lack a proper understanding of physics concepts. They are only able to express some basic physics concepts, and some students are unaware of these concepts. Water hyacinth fiber is deemed suitable and viable as an alternative material to produce Songkok Recca. This conclusion is supported by the feasibility test results, which indicate that the average tensile strength of wet water hyacinth fiber is 20.808,74021 N/m^2, while the average tensile strength of dry water hyacinth fiber is 841.418,2808 N/m^2.

ACKNOWLEDGMENTS

The researcher would like to thanks to my supervisor has supported and assisted the researcher this matter is listed under number: 2513/UN36.1/TU/2020. Thanks to the principal of SMAN 16 Bone for giving permission to researchers to conduct research based on number: 4396/UN36.1/TU/2021.

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