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Profile of Science Literacy and Cultural Awareness of Students and the Need for Science Teaching Materials Integrated with Local Potential of STEAM-PBL Based Petis in Sumenep

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Abstract: Science literacy is a must have ability for students in the 21st century and cultural awareness is needed so that students can selectively choose outside cultures. However, in Indonesia science literacy and cultural awareness are low. This study aims to determine the profile of science literacy and cultural awareness of students and the need for STEAM-PBL-based local potential integrated science teaching materials. This research is a descriptive research. The research sample amounted to 93 junior high school students in 3 Sumenep District schools selected by purposive random sampling technique. Data collection used tests to measure science literacy, questionnaires to determine cultural awareness and need STEAM-PBL-based local potential "petis" integrated science teaching materials. Data analysis using quantitative descriptive analysis techniques. The results showed; 80.65% of students were in the low category and 19.35% were in the medium category, the lowest student ability was to explain phenomena scientifically; 88.17% of students' cultural awareness was in the low category and 11.83% of students were in the medium category. Based on the results of the study, it is concluded that students' science literacy and cultural awareness are low and it is necessary to develop teaching materials integrated with the local potential of STEAM-PBL-based petis.

Keywords: Cultural Awareness; Local potential; Science Learning; Science Literacy

Introduction

The independent curriculum is the latest curriculum implemented by the Ministry of Education and Culture (Lidiawati et al., 2023). The characteristic of the independent curriculum is the realization of the contextuality of essential material by linking to everyday life. Another feature of the independent curriculum is the project to strengthen the Pancasila student profile (P5), one of which is global diversity. One of the key elements of global diversity is recognizing and appreciating culture. Cultural values must be instilled in society, so that they can provide a filter for global issues.

Cultural awareness is concerned with understanding the influence of culture on human values and behavior. Cultural awareness is a person's ability to realize the cultural values and customs of the incoming culture. Furthermore, a person can assess whether this is normal and acceptable in his culture or may be unusual or unacceptable in other cultures (Setiawan et al., 2017). It can be concluded that cultural awareness is an attitude to know and understand the influence of culture on human values and behavior and be able to filter out foreign cultures that enter people's behavior so that they are able to assess the suitability of foreign cultures with the norms that exist in Indonesia.Awareness of the importance of local culture as a national identity is needed for today's younger generation (Harianto &

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Amin, 2023). Ideally, every citizen should be actively involved in preserving culture as the nation's identity (Fatmawati, 2021). The importance of efforts in preserving culture on an ongoing basis to increase public knowledge related to culture. Facts in the field, the current era of globalization makes the younger generation prefer to admire foreign cultures because people's perspectives on foreign cultures are more attractive, considered new, more unique and practical when compared to local culture. Research conducted by Indriyani et al. (2023) shows that student involvement in the attitude of preserving local culture is still in the very low category with a score of 9.22%, which indicates that student involvement in preserving native culture needs to be developed optimally.

One of the most important goals of science education is the development of science literacy. Teachers must be able to develop learning contexts that provide opportunities for students to reintegrate into society through designing science literacy programs that are aligned with students' socio-cultural characteristics and are competencies that are seen as important for students to have, not only in the United States but also around the world (Dragoş & Mih, 2015).

Science literacy is part of the 21st century skills that students must master in order to keep up with global currents. Literacy skills are needed in solving global challenges appropriately to solve problems, make decisions, and understand natural and social events. Science literacy skills act as a basis or reference in education (Atiaturrahmaniah et al., 2022; Nirmalasari et al., 2021). Science literacy is a person's understanding of science and the ability to apply it in people's lives. There are four aspects of science literacy including basic literacy, epistemic knowledge, identifying and assessing scientific expertise, and deposition and habits of thinking (Snow & Dibner, 2016; Wasis et al., 2020). It can be concluded that science literacy is an understanding of scientific concepts and processes and the ability to evaluate scientific information needed for decision-making on issues through scientific principles and methods.

Facts in the field show that students in understanding basic science concepts are still low and less able to interpret tables or graphs (Yusmar & Fadilah, 2023). The results of PISA in Indonesia in 2022 for the categories of mathematics, reading and science show that Indonesia is in 69th, 70th and 66th positions out of 81 countries, respectively. This shows that Indonesia has increased 5-6 positions compared to PISA 2018. Despite the increase in rank, there was a decrease in the average score on each assessment subject, namely 366, 359 and 383 in the Organization for Economic Co-Operation and Development (OECD) (Schleicher, 2023). Research conducted by Qodriyah et al. (2021) related to the analysis of the science literacy skills of junior high school students in urban and rural areas in Sumenep District shows that the evaluation sub-indicator in using scientific information in urban areas is 63.25% and in villages is 67.5%, and students' ability to make inferences, predictions, and draw conclusions based on quantitative data in urban areas is 74.36% and 47.5%. Based on these facts, aspects of students' science literacy competencies are still very low and must be improved, one of which is through the application of information technology.

Universally, the development of information technology provides interest to students and teachers in education. The application of information technology through teaching provides flexible, interactive learning, expanding content planning and learning models (Sun & Pan, 2021). The delivery of information in the current era can be through interactive media that is increasingly developing, so that it is able to combine and combine graphics, sound, video, animation, and text. Indonesian culture can be conveyed through interactive animation applications to make it more interesting and easy to understand (Wulandari et al., 2023). Science learning integrated with local potential has the opportunity to train students in observing and conducting experiments independently. Students become aware of the potential in their area, adaptive to search, process, and find information to solve problems in their environment (Usmeldi & Amini, 2020; Wilujeng, 2019).

Integration of local potential in science learning has not been done optimally. Contextuality and cultural awareness can be trained through the integration of science learning with the local potential. One of them is the local potential of making petis in Madura. Petis is a food product that has a semi-wet texture with a paste shape obtained from by-products or waste from meat, fish or shrimp. Generally in the community, petis is used as a seasoning for traditional foods such as rujak cingur, kupang, clover, lontong balap and mixed tofu and fruit salad seasoning. The local potential of Madura Sumenep petis both in terms of its manufacture and utilization can be associated with science learning materials, so that it can be integrated in the learning process through a medium or teaching material.

The urgency of applying teaching materials integrated with local potential in the learning process, in accordance with the results of research conducted by Setianingrum et al. (2023) which shows that students' love for local culture obtained from the questionnaire results is high and students are interested in participating in learning activities with the help of science e-books containing local wisdom gamelan based on STEAM-POE. Students' love for local culture

facilitated by science e-books containing local wisdom gamelan based on STEAM-POE has been achieved. Teaching materials can facilitate science literacy and cultural awareness attitudes if used in certain learning approaches and models, one of which is the STEAM approach and PBL model.

In accordance with the implementation of the UNESCO 2030 agenda through STEAM and technology education, learning should include consideration of social inclusion, cultural values, and ethics to convey ethical principles and values (Aguayo et al., 2023). Through STEAM, students' competencies in cognitive and affective learning are effective. STEAM experts view STEAM lessons as flexible, so they can be adapted to local needs (Kang, 2019). Research conducted by Kim & Chae (2016) on the development and application of STEAM programs based on traditional Korean culture, students can develop a strong understanding of scientific principles, creativity, interest and motivation for science. So that it plays a role in increasing national competitiveness in the field of science and improving problem solving skills by exploring the beauty of traditional Korean culture.

Problem Based Learning (PBL) can be used as a solution to improve students' science literacy because there is a connection, for example in the initial syntax of PBL, namely problem orientation, students can connect problems with students' previous knowledge. Students will find facts by conducting investigations to get conclusions that are used as problem solving (Pakpahan, 2022). The steps in the PBL model refer to problems with the aim of building knowledge, assessing learning progress, and building scientific communication. Therefore, through the PBL model, it is expected to improve students' science literacy (Karmila et al., 2020). It is important to conduct research on the science literacy profile and cultural awareness of junior secondary school students in Sumenep district to gain an in-depth understanding of the level of science competence and the influence of local culture on education. This research will provide valuable insights to design more effective teaching strategies and strengthen cultural integration in the education curriculum in schools, thereby improving the quality of education and the relevance of learning for students in Sumenep district.

Research on the profile of science literacy and cultural awareness of junior high school students in Sumenep district and needs analysis of science teaching materials integrated with the local potential of petis making based on the STEAM-PBL approach bring significant renewal in the field of education. This research offers an innovative approach by incorporating science literacy relevant to local culture and aligning teaching materials with local contexts to improve student understanding and engagement. By utilizing local potential, this research can also create more contextual and applicable learning materials, as well as enrich students' learning experience through a project-based and problem-solving approach that is in accordance with the local characteristics of Sumenep.

The novelty of this research is to obtain new findings related to the profile of science literacy and cultural awareness of students, as well as recommendations for the application of science teaching materials integrated with the local potential of STEAM-PBL-based petis to improve students' science literacy and cultural awareness. Based on the explanation above, the purpose of this study is to determine the profile of science literacy and cultural awareness of students and the need for the application of science teaching materials integrated with the local potential of STEAM PBL-based petis in several Sumenep District schools.

It is important to conduct needs analysis research on science teaching materials integrated with local potential in petis making based on the STEAM-PBL approach in the Madura area. This research will ensure that the teaching materials developed are relevant to the local context and meet specific educational needs. Thus, learning materials can utilize local cultural and economic potential, increase student engagement, and facilitate understanding of science concepts more effectively through a project-based and problem-solving approach.

Method

This research used descriptive quantitative and qualitative research methods. The first thing to do is to determine the focus of research in the form of student science literacy profiles and student cultural awareness, as well as the need for science teaching materials integrated with the local potential of making STEAM-PBL-based petis. Furthermore, determining the population, the population in this study were junior high school students from 3 schools in Sumenep District.

The research sample was determined by purposive random sampling so that 93 ninth grade students were selected. This study focuses on the profile of science literacy and cultural awareness of students, as well as the need for science teaching materials integrated with the local potential of STEAM-PBL-based petis in terms of students' knowledge related to making petis and the type of teaching materials expected by students.

Quantitative data collection uses question instruments and questionnaires, with the aim of measuring the profile of science literacy, students' cultural awareness and the need for teaching materials that are relevant to students' needs. Qualitative data

collection uses interviews with several science teachers in 3 schools in Sumenep District, which aims to explore students' knowledge related to making petis and the types of teaching materials needed. Quantitative data analysis was conducted for statistical analysis in assessing science literacy, cultural awareness and teaching material preferences. Qualitative data analysis was carried out for thematic analysis to determine the needs of student teaching materials.

The instrument for collecting data on science literacy skills used a description test consisting of 5 questions taken from the 2018 PISA questions. Indicators and sub-indicators of science literacy competencies consist of 3 aspects adopted from (Snow & Dibner, 2016) which can be seen in Table 1.

Table 1. Science literacy indicators and sub-indicators

Indicators	Sub indicator
Explaining phenomena scientifically	Describe a phenomenon scientifically
	Apply appropriate science knowledge in life
Evaluating and designing scientific questions	Identify questions that can be explored scientifically
Interpreting scientific data and evidence	Convert data from one representation to another
	Draw conclusions from scientific data and evidence

Assessment of student science literacy test results is done by giving a score to each student's test answer and calculating the total score of each item obtained by students. Furthermore, converting the answer score into a value on a 0-100 scale using Formula 1 (Qodriyah et al., 2021).

$$NDP = \frac{\text{Score obtained by Learners}}{\text{Total Score}}\ x\ 100 \quad (1)$$

Description:
NDP = student value

Analysis of students' science literacy skills is done through calculations used through student scores on each indicator of student science literacy tested using Formula 2.

$$P = \frac{\text{Average score per indicator}}{\text{Maximum Score of Indicator}}\ x\ 100 \quad (2)$$

Description:
P = Average science literacy skills indicator

The calculation of the final score is done by dividing the score obtained by the student with the maximum score. Furthermore, the scores are categorized as Table 2 (Rohmah & Prahani, 2021).

Table 2. Science Literacy Category Range

Scores	Range category
75 < scores ≤ 100	High
45 < scores ≤ 75	Medium
Score ≤ 45	Low

The instrument for collecting data on students' cultural awareness uses a questionnaire consisting of 30 statements using 5 aspects obtained from the synthesis which can be seen in Table 3.

Table 3. Indicators and subindicators of students' cultural awareness

Indicators	Sub Indicator
Cultural knowledge	Knowing the culture contained in the region itself, namely petis making
	Get to know the local culture of petis making as the nation's identity
Understanding values and perspectives	Formulate petis making cultural values
	Understand the meaning of petis making cultural values
	Understand and interpret events around in the context of values, norms and in accordance with cultural practices in the area
Personal involvement with culture	Participate in petis-making culture
	Have an attitude of responsibility in maintaining the existence of petis making culture
Cultural implementation and development (1)	Demonstrate an attitude of preserving petis-making culture
	Apply cultural values in everyday life
	Integrate petis making cultural values in aspects of life, for example in school learning
Pride and appreciation of culture	Showing a sense of belonging to petis making culture as the wealth of the nation's ancestors
	Show a sense of pride in the culture (making petis) around you through attitudes and actions

This cultural awareness questionnaire uses a *Likert scale* where there are 4 assessment criteria from this questionnaire, namely strongly agree (SS), agree (S), disagree (TS), strongly disagree (STS). Likert scale assessment can be seen in Table 4.

Table 4. Likert scale questionnaire assessment

Scale	Statement value positive	Statement value negative
Strongly agree (SS)	4	1
Agree (S)	3	2
Disagree (TS)	2	3
Strongly Disagree (STS)	1	4

After being analyzed, the results are categorized similarly to the categorization of students' science literacy abilities, namely in Table 2. Collecting data on student needs for science teaching materials integrated with local potential based on STEAM-PBL is done by distributing a four-point Likert scale questionnaire, namely strongly agree (SS), agree (S), disagree (TS), strongly disagree (STS). The questionnaire of student needs for teaching materials consists of 3 aspects that are measured, namely: Knowledge of the local potential of petis making, learning problems, and the type of teaching materials expected by students. Data processing is done by calculating the percentage of each response chosen by students. In addition, the need for science teaching materials integrated with the local potential of STEAM-PBL-based petis is also supported by data from interviews with 3 science teachers at each school in Sumenep, namely MTsN 2 Sumenep, SMP Yayasan Abdullah Sumenep, and SMP Al-Ghazali Batang-Batang Sumenep.

Result and Discussion

Science Literacy Profile of Learners

Based on the results of the study, data on students' science literacy and cultural awareness attitudes were obtained. The learners' science literacy profile was reviewed from three indicators, namely explaining phenomena scientifically; evaluating and designing scientific questions; and interpreting data and scientific evidence. Learners' science literacy was measured using descriptive questions totaling five questions. The science literacy profile of learners from the three sample schools is presented as Figure 1.

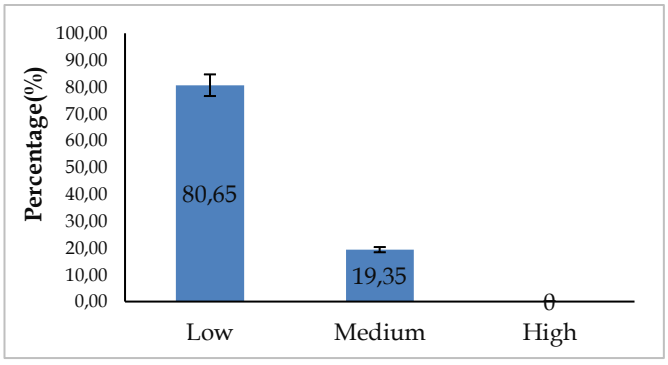

Figure 1. Science Literacy Measurement Results

Based on the data of students' science literacy results in Figure 1, the majority of students are in the low category, which is 80.65%. This shows that their science literacy skills still need to be improved. Although there are a small number of learners who are in the medium category, as many as 19.35%, but none reached the high category. This shows the challenge in improving the understanding and skills in science literacy among learners.

The detailed frequencies of each category from the three junior secondary schools in Sumenep district can be seen in Table 5.

Table 5. Results of students' science literacy skills

Score	N	Range category
75 <scores≤100	0	High
45 <scores≤ 75	18	Medium
Score≤45	75	low

Description:
N= Number of Student

Based on table 5, it can be seen that of the 93 samples in the study, there were no students who had a range of scores in the high category (75 <scores≤100)%, 18 students were in the medium category (45 <scores≤ 75%), and 75 students were in the low category (Score≤45%).

The science literacy profile of students in the three sample schools can be reviewed from each indicator. Data analysis of students' science literacy on each indicator is presented in Figure 2.

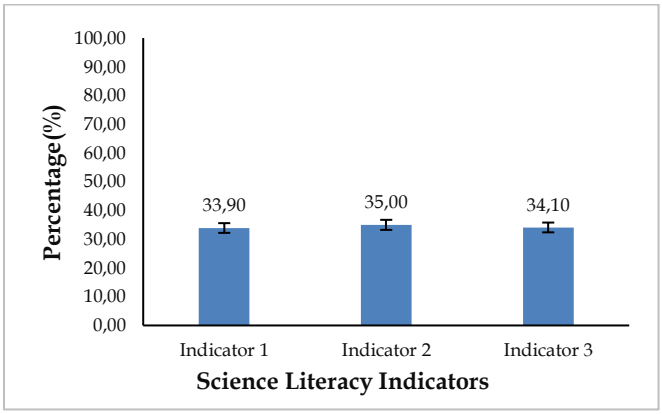

Figure 2. Average Science Literacy of Learners for Each Indicator

Based on Figure 2, it can be seen that the results of students' science literacy on each indicator show that the level of achievement varies for each indicator. Indicator 1 has a score of 33.9%, indicating a fairly low level of science literacy in that indicator. Indicator 2 has a score of 35%, higher than the first indicator. Meanwhile, indicator 3 has a score of 34.1%, indicating that science literacy in all indicators is still in the low category.

The highest indicator is the second indicator, evaluating and designing scientific questions, but it is still in the low category. The ability to evaluate and design scientific questions relates to the ability to identify questions that can be explored scientifically. Students' science literacy in this indicator is in the low category. This is because students' ability to recognize questions that can be used as objects of scientific research is still inadequate, even though science literacy requires students to be able to distinguish between questions that can be answered with a scientific approach and questions that cannot be explored in a scientific way. This finding confirms previous research findings which show that students' understanding of basic science concepts is still low and the ability to interpret tables and graphs is also lacking (Yusmar & Fadilah, 2023).

In the three indicators, the lowest indicator is explaining the phenomenon scientifically. The ability of students on this indicator reflects the ability of students to describe a phenomenon scientifically and apply appropriate science knowledge in life. Based on the data obtained, it is known that the ability to describe a phenomenon scientifically and the ability to describe an event or phenomenon scientifically accurately is still not well trained. This can be caused by the importance of applying science knowledge in everyday life which shows that the ability to apply science concepts in a real context still needs to be improved. The low level of this indicator is also supported by research conducted by (Tulaiya & Wasis, 2020) which shows that students' competence in explaining phenomena scientifically is 26.00% which is in the low category. The cause of the low ability of students in explaining phenomena scientifically is supported by research conducted by Ning et al. (2020) & Permatasari (2022) which shows that this happens because students still do not have the ability to identify scientific concepts, predict or interpret phenomena around them scientifically and the changes or impacts that occur due to these phenomena. In addition, it is also caused by the difficulty of students in remembering the scientific language in a material.

Students' science literacy skills can also be caused by factors of educators who teach science, where educators must have good competence and be able to master science learning materials and methods very well. This is in line with research conducted by Jamaluddin et al. (2019) which shows that students' science literacy skills will increase significantly if science educators have a good mastery of science teaching materials and methods. The development of science literacy is crucial for students to compete effectively in the current and future era of information technology, where global competition is increasingly fierce.

Translated with DeepL.com (free version)

Another study conducted in several schools in Sumenep city also showed that the scientific abilities of high school students are still low, the ability to explain phenomena scientifically, evaluate and design scientific investigations, and understand scientific data and evidence scientifically (Tulaiya & Wasis, 2020). Therefore, the results of this study highlight the need for more serious efforts to improve students' science literacy. This can be achieved through a more active learning approach, the application of appropriate learning methods and the use of learning materials that are relevant and interesting to students. Research conducted by Hasasiyah et al. (2019) shows that in the indicator of students' ability to solve problems based on scientific phenomena, students still have to practice a lot and improve their understanding of science concepts that are integrated with phenomena and events in nature and everyday life, especially in science learning. Therefore, the results of this study highlight the need for more serious efforts to improve students' science literacy. This can be achieved through a more active learning approach, the application of appropriate learning methods and the use of relevant and interesting learning materials for students.

Translated with DeepL.com (free version)

Students' Cultural Awareness Attitude Profile

The attitude profile of students' cultural awareness is measured using a questionnaire instrument. Learners' cultural awareness profile shows attitudes and actions related to their concern, sensitivity, and responsibility for culture to maintain, manage, develop, and preserve it. The results of measuring learners' cultural awareness in the three sample schools in Sumenep are shown in Figure 3.

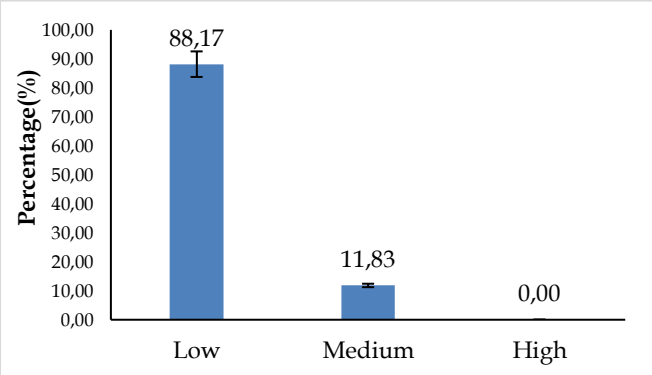

Figure 3. Results of Measurement of Cultural Awareness Attitude

Based on Figure 3, it can be interpreted that the majority of students from the three schools still have cultural awareness in the low category. Low cultural

awareness indicates that learners lack understanding or appreciation of the cultural values, traditions and heritage of their community. This can be caused by various factors such as a lack of cultural education, minimal exposure to cultural activities and festivals, and even a lack of more dominant external cultural influences. The data also shows that there is potential to increase cultural awareness among students in the three schools. This can be achieved through a more holistic and integrated approach to education that includes learning about local culture, extracurricular activities and community projects that strengthen cultural identity and pride in cultural heritage.

The detailed frequencies of each category from the three junior secondary schools in Sumenep district can be seen in Table 6.

Table 6. Results of students' cultural awareness

Scores	N	Range category
75 <scores≤100	0	High
45 <scores≤ 75	11	Medium
Score≤45	82	low

Description:
N= Number of Student

Based on Table 6, it can be seen that of the 93 samples in the study, the ability of students' cultural awareness has no students who have a range of scores in the high category (75 < score≤100%), 11 students are in the medium category (45 < score≤ 75%), and 82 students are in the low category (Score≤45%).

Students' cultural awareness can then be reviewed from each indicator of cultural awareness measured. Cultural awareness in this study was reviewed from five indicators, namely: cultural knowledge; understanding of values and perspectives; personal involvement in culture; implementation and development of culture; and pride and appreciation of culture. The results of the analysis of the level of cultural awareness of students on each indicator of cultural awareness are presented in Figure 4.

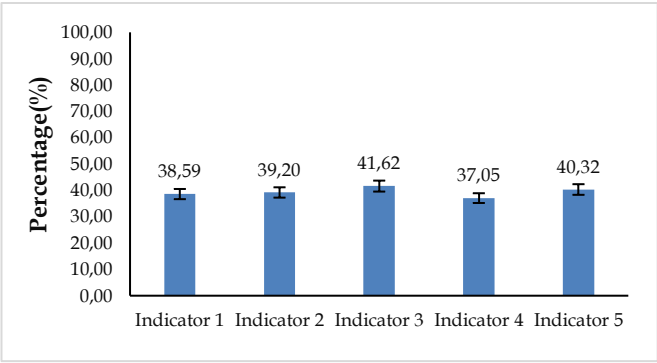

Figure 4. Average Attitude of Cultural Awareness of Learners for Each Indicator

The data in Figure 4 shows that students' cultural awareness in each indicator is still in the low category. Based on the results of the analysis, it can be seen that the ability of students in several indicators of cultural awareness is still low. The indicator that shows the highest learner cultural awareness is in the third indicator, namely personal involvement in student culture is still low. This shows a lack of participation in petis-making cultural activities and a lack of attitude of responsibility in maintaining the existence of the culture. This is supported by the research of Indriyani et al. (2023) which shows that the low cultural awareness of students shows that student involvement in preserving native culture needs to be optimally developed.

While the lowest indicator is the fourth indicator, namely the implementation and development of culture, this is because students do not show an attitude of preserving the culture of making petis, applying these cultural values in everyday life, and integrating them into aspects of life, such as in school learning. The lack of students in implementing and developing culture is caused by the entry of foreign cultures that create cultural imbalances and make the original culture of local communities experience a drastic decline (Artisna et al., 2022). This is also in line with research conducted by Nahak (2019). which shows that students are not proud of local products and culture, students are more familiar and proud of outside cultures which sometimes do not match the personality of eastern society, so students lack awareness to preserve and develop their own culture.

Based on this, there is potential to increase students' cultural awareness with a more holistic and integrated educational approach, as well as through teaching materials, learning models, or collaborative projects that strengthen cultural identity and a sense of pride in their cultural heritage, so it can be recommended that science learning be integrated with local culture in order to increase students' cultural awareness and invite them to maintain their local cultural heritage.

The low cultural awareness of students can be caused by the lack of cultural integration in school learning. The lack of learning about cultural knowledge and traditions in the younger generation can have a negative impact that can lead to the fading of cultural values, local wisdom, and a shift in existing cultural values (Harianto & Amin, 2023). Students' cultural awareness is also influenced by foreign cultures received by the younger generation, starting from responses, attitudes and behavior. Thus, it is necessary to introduce local wisdom to the younger generation, especially students as a values filter in the current era of globalization and modernization to filter positive values

that are appropriate in accordance with Indonesian cultural values.

Student Response to the Needs of Science Teaching Materials Integrated with Local Potential of STEAM-PBL Based Petis

Analysis of student characteristics was reviewed to determine student characteristics and understand student needs for teaching materials and various aspects of school life. The aspects studied are knowledge of the local potential of making petis, learning problems, and the types of teaching materials expected by students. The results of the questionnaire distribution on the knowledge aspect of the local potential of petis making are presented in Table 7.

Table 7. Knowledge of Local Potential Petis

Statements	Percentage (%)
The process of making petis is one of the local potentials found in the Sumenep area	87.90
The process of making and utilizing petis contains cultural aspects 11	88.48
The local potential of the process of making and utilizing petis is related to the concept of science 82	87.63
The school has introduced the local potential of petis making	41.94
The petis making process can foster a sense of responsibility and good responsiveness in maintaining local potential	79.84
Cultural values of local potential petis making must be applicable in everyday life	88.17

Table 7 shows that petis making in the Sumenep area is considered a significant local potential, with 87.90% of respondents agreeing. Furthermore, 88.48 per cent of respondents believe that the process of making and utilizing petis contains important cultural aspects. In addition, the majority of respondents (87.63%) saw a connection between this local potential and the concept of science. However, only 41.94% of respondents considered that the school had introduced the local potential of petis making. Nevertheless, most respondents (79.84%) agreed that the petis-making process can foster a sense of responsibility and a good response in maintaining local potential, while 88.17% of respondents agreed that cultural values in petis-making should be applied in daily life.

Of the six statements, the lowest statement is that the school has introduced the local potential of petis making. This is because teachers rarely and almost never integrate local potential into the learning process, especially in science (Safitri et al., 2018). Therefore, the questionnaire results indicate the need for further efforts to improve the integration of the local potential of petis making in education and the daily lives of the Sumenep community. Contextuality and cultural awareness can be trained through the integration of science learning with this local potential.

Students' needs for teaching materials are also reviewed in the aspect of learning problems faced by students. Learning problems that are the focus of the questionnaire statement are related to the topic or science material. the results of the distribution of questionnaires in the aspect of learning problems are presented in Table 8.

Table 8. Learning Problems

Statements	Percentage (%)
Science material is difficult to understand because the topic is abstract	88.44
Science material is easy because it is taught contextually (e.g. integrating crate making)	37.37
Science material is interesting because it relates to events around us	36.02

Based on Table 8 about students' learning problems, it can be seen that the majority of respondents (88.44%) felt that science materials were difficult to understand because the topics were abstract. Meanwhile, only a small proportion of respondents felt that science materials became easier to understand (37.37%) when taught contextually, for example by integrating petis making in learning. This also applies to students' perception that science material becomes interesting because it is related to events around us, where only 36.02% of respondents agreed with the statement.

The lowest statement of the three statements is that science material is interesting because it is related to events around us. This is because students have difficulty in finding scientific concepts contained in surrounding events, so it is considered uninteresting because the teacher is lacking in introducing scientific concepts to surrounding events. This is in accordance with research conducted by Sari et al. (2018) which shows that the learning process applied by teachers has almost no connection between concepts in science materials and local culture or potential in everyday life, especially those found in the environment around schools so it is recommended to develop learning methods that are more oriented to students' daily lives, by linking scientific concepts in science with culture or local wisdom.

Thus, the main problem faced in learning science is the complexity of abstract topics, while the contextual approach and the relevance of material to everyday life are still things that need to be improved.

Students' needs for teaching materials are then reviewed from the aspect of the types of teaching materials expected by students. The types of teaching materials referred to in this study are related to the integration of local potential, contextual and electronic. The results of the questionnaire distribution in this aspect are presented in Table 9.

Table 9. Types of teaching materials expected by students

Statements	Percentage (%)
Science materials are easier to understand if they use teaching materials that are associated with known local potential	92.20
Science teaching materials that are in accordance with surrounding events make science materials not abstract	87.10
Teaching materials that can be accessed on *mobile phones* and computers make me more flexible in learning	86.02
Understanding the concept of science is easier when the science material is supported by images, videos and animations	86.56
Learning that relates to surrounding events makes the learning process more interesting	84.14
Science learning is more interesting when facilitating to solve surrounding problems with the concept of science	84.41

Based on Table 9 regarding the types of teaching materials expected by students, it can be seen that most students want the use of teaching materials related to the local potential they know (92.20%), because this is considered to facilitate understanding of science material. In addition, most also want teaching materials that are in accordance with the surrounding events so that science material does not feel abstract (87.10%). In addition to the local context and surrounding events, easy access through devices such as mobile phones or computers is also expected by most students (86.02%), because this can make them more flexible in learning. In addition, students also want visual support such as pictures, videos or animations in science learning to facilitate understanding of concepts (86.56%). In addition to ease of understanding, students also want more interesting learning by linking science material with events around them (84.14%) and making it easier to solve problems around them with science concepts (84.41%). Of all these statements, the lowest statement is that learning that relates to surrounding events makes the learning process more interesting. This is because schools have not optimized local potential to be used as teaching materials in science learning (Pamungkas et al., 2017).

Thus, it can be concluded that students want teaching materials that are relevant to the local context and surrounding events, easily accessible, and support concept understanding and active involvement in learning. In line with research conducted by Usmeldi & Amini (2020) shows the application of local wisdom-based science learning can improve student character and active student involvement in the learning process, so that students are given the opportunity to develop their competence. The results of the study Hikmawati et al. (2021) show that the application of the PBL model integrated with local wisdom can affect the improvement of students' higher order thinking skills and scientific attitudes in the learning process. Through integrating local potential in science learning, it can be used for more complex materials, making it easier for students to understand.

Based on the results of interviews conducted with three science teachers in three schools in Sumenep for the needs of teaching materials in terms of the STEAM approach and PBL learning model. Based on the results of interviews from 3 science teachers, it shows that the approach that teachers often use in learning science is the method of demonstration and experimentation, for the STEAM approach to learning in 2024/2025 even semester has never been done by the teacher. This is because the teacher himself still has difficulty linking STEAM mapping to science material. Based on the results of the interviews conducted, it also shows that the models often used by teachers are discovery learning and inquiry. Teachers also use the PBL model but it is not optimal in training students in solving problems because the problems raised in learning are not fully contextual or related to students' daily lives.

Based on the results of data analysis from questionnaires and interviews, it shows the urgency of the need for science teaching materials integrated with local potential based on STEAM-PBL. And these teaching materials are expected to increase students' science literacy and cultural awareness. This is in line with research conducted by Atiaturrahmaniah et al. (2022) Science, Technology, Engineering, Mathematic (STEAM) applied in schools is able to provide critical thinking skills, collaborative, and students can first analyze the information obtained. Research conducted by Nuzula & Sudibyo (2022) which shows that there is an increase in the competence or process of science literacy of students through a problem-based learning model with the acquisition of the N-Gain average including the medium category. This is in accordance with Angga (2022) research, which shows that the application of STEAM-integrated PBL can improve students' 4C (Communication, Collaboration, Creativity and Innovation, Critical Thinking and Problem Solving)

abilities. The stages of the PBL model can train students' abilities such as prediction, planning, investigation and evaluation (Ramdoniati et al., 2018).

Learning in schools with a STEAM approach can be done to young people. This is in line with research conducted by Sung et al. (2023) which shows that STEAM programs integrated into the national curriculum in early childhood education environments in Korea are empirically proven to increase the effectiveness of learning in accordance with children's development and can significantly improve vocabulary, counting, self-regulation, and how to socialize students before and after teachers apply the STEAM approach. The results of a meta-analysis conducted by Asrizal et al. (2023) show that of the 20 research articles that have been obtained, learning using the STEAM approach can improve student learning achievement. This is because the approach directs students to learn science and art simultaneously. STEAM learning applied in Korea encourages student independence in science and technology, is able to solve problems in a creative way and can explore research subjects (Cheng et al., 2022). Not only in Korea, education in Uzbekistan using STEAM according to teachers' perceptions is considered a method that can provide more science teaching and learning in the education system (Lee, 2021).

As a teacher must be aware of increasing understanding and skills in designing and implementing learning that is oriented towards 21st century skills through the PBL model. This is in line with research conducted by Nurhayati et al. (2023) which shows that PBL is one of the fields of study that significantly contributes to education, especially in the field of science education. This is in line with research conducted by Hasanah & Sari (2023) & Wumu et al. (2023) which shows that through the PBL model applied in learning there is a significant effect between the results of students' science literacy using this learning model. PBL model is effective to improve students' science literacy. The increase in science literacy occurs because the PBL model can build active learning and students seek their own knowledge to solve problems and find alternative solutions.

Therefore, for further research, research can be carried out to determine whether or not there is a significant change in the ability of science literacy and cultural awareness of students by using science teaching materials integrated with the local potential of STEAM-PBL-based petis making in several Sumenep District schools.

Conclusion

Based on the results of the research and data analysis above, the majority of students' science literacy skills are in the low category with a percentage of 80.65% and the majority of students' cultural awareness is in the low category with a percentage of 88.17%. The results showed that the science literacy and cultural awareness of students from three schools in Sumenep District were in the low category and science teaching materials integrated with the local potential of STEAM-PBL-based petis in learning were needed. Therefore, it can be concluded that innovation is needed in the development of teaching materials to improve students' science literacy and cultural awareness. One of them is through the development and application of science teaching materials integrated with the local potential of STEAM-PBL-based petis, to improve the science literacy skills and cultural awareness of students in Sumenep City.

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Author Contributions

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This research was unfunded. A needs analysis related to science literacy and cultural awareness of students was obtained. The findings of this profile are an analysis of these needs to be followed up through research on the development of teaching materials in the field of science education. To facilitate the needs of science literacy and cultural awareness of students who are still low.

Conflicts of interest

This reseacrh no conflict of interest reagrding the publication of this paper

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