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Analysis of Ethnobotanical Knowledge Science Literacy Profile in PGSD Students: Case Study of Karimun Akit Tribe Medicinal Plants

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Abstract. Science literacy is the ability to understand scientific concepts and processes, which are used to identify problems, explain scientific phenomena, and solve problems by applying them in various daily human activities. This ability is important as a basic capital and potential that prospective teachers must have to face challenges in the 21st Century. This understanding of science concepts and processes can be integrated in a local knowledge of the community in an area such as ethnobotanical knowledge. This study aims to analyse the science literacy profile of students about ethnobotanical knowledge of medicinal plants used by the Karimun Akit Tribe. The method used is a survey method with a quantitative descriptive approach. The sampling technique used purposive sampling, namely students of the Karimun University Primary School Teacher Education (PGSD) study programme in semesters 2, 4 and 6 totalling 39 people. The instrument used was 20 multiple choice questions that had been validated. The results of this study indicate that the science literacy ability of PGSD students at Karimun University towards ethnobotanical studies of medicinal plants by the Karimun Akit Tribe has an average score of 55.64 with a low category. In addition, the results of student achievement in each science literacy competency obtained a very low category with sequential percentage scores, namely: the ability to explain phenomena scientifically (40.55%), the ability to interpret data and evidence scientifically (31.80%), and the ability to evaluate and design scientific investigations (27.65%). Efforts to improve low science literacy are by teaching science literacy in a sustainable manner, compiling material systematically, and planning the learning process using the right learning model.

Keywords. ethnobotany, science literacy, PGSD students, medicinal plants

INTRODUCTION

In the 21st Century, referred to as the 'technological era', knowledge will be increasingly diffused due to the rapid advancement of technology and information. This will impact a country's culture, economy and politics, and everyone must be able to adapt by having the ability to support it[1]. Quality human resources are an important factor in a country's development[2]. In this 21st century, education plays an important role in supporting the process of developing the quality of its human resources, which means that education must prepare students who are able to face global competition[3]and have the ability to respond to changes that occur along with the times[4]. In this century, the world of
science is increasingly connected, which results in faster synergy. For this reason, an ability that can support it is needed, namely the ability in science literacy.

Science literacy is defined as a person's scientific knowledge and the use of that knowledge to identify questions,

acquire new knowledge, explain scientific phenomena, and draw evidence-based conclusions about issues related to science. Science literacy also includes an understanding of the unique characteristics of science as a form of human knowledge and inquiry, and an awareness of how science interacts with science, technology, culture and the environment[5]. Students' ability to understand problems in a modern society that relies heavily on technology and advances in science and knowledge is strongly linked to science literacy. According to OECD 2018, PISA (Programme for International Student Assessment) identified three main competencies in science literacy, namely: the ability to explain phenomena scientifically, the ability to evaluate and design scientific investigations, and the ability to interpret data and evidence scientifically[6].

Science literacy skills can be obtained from various aspects of literacy in accordance with the expected goals. The more aspects of literacy mastered by students, the better their understanding in applying scientific concepts meaningfully, thinking critically, and making balanced and appropriate decisions related to problems relevant to their lives[3,7]. The international community has recognised the importance of science literacy, especially in the field of science education. This scientific ability can help people make decisions and accept alternative perspectives that are based on scientific evidence[8]. Over the past four years, Indonesian students have had low average science literacy scores, scoring 382-403 in the 2006, 2009, 2012 and 2015 PISA assessments[9]. Furthermore, in 2018, the score dropped again with a score of 396 (Kemdikbud, 2019). In 2022, Indonesia's science literacy dropped from 396 to 383. Despite the declining score, Indonesia placed 66th out of 81 countries globally, up six places from 2018. It is suspected that the decline in Indonesia's PISA score is due to a decline in learning or loss of knowledge during the COVID-19 pandemic (Kemendikbud, 2023). This low science literacy ability will have an impact on students' understanding of science concepts needed to better understand lessons.

Low science literacy skills will cause students to be less able to develop creativity in applying science in everyday life. They also face difficulties in solving problems and are slow in making decisions. In addition, low science literacy makes them less responsive to issues and developments related to the surrounding environment, such as natural phenomena and local characteristics[10,11]. Some of the research results in Indonesia show that the science literacy skills of students in various locations are still relatively low[12–14]. Therefore, science learning needs to integrate aspects of science literacy to improve science literacy skills. One of the science learning materials that can improve science literacy skills is material about plants used by local communities as medicinal plants called ethnobotany.

Ethnobotany is the scientific study of the interaction between humans and plants, with a focus on the use of plants by the community, especially the knowledge and customs of indigenous peoples[15]. This ethnobotanical material is integrated into the Kingdom Plantae material in the basic concepts of biology course for students of the Karimun University Primary School Teacher Education Study Programme (PGSD). In this material, it is studied how the local people of Karimun Regency, in this case the indigenous tribe of Karimun Regency, which is usually called the Akit tribe, utilise plants around their environment as medicinal plants. This material has a close relationship with science literacy because students still do not really understand the parts and functions of each type of plant and their use by the Karimun Akit Tribe, even though they are prospective elementary school teachers who will later teach their students. The development of science literacy skills must begin at an early age, especially in primary school, so that students can build more comprehensive competencies gradually. Science literacy has great potential to be developed at the primary level through science learning that includes the basics of knowledge and skills needed[12]. The success of students' science literacy in learning is influenced by internal and external factors. Factors that contribute to students' science literacy include interest in science, motivation to learn, learning strategies used by teachers, and facilities available at school[9]. Teachers have an important role in helping students develop good science literacy. To optimise students' science literacy, teachers can design effective learning strategies, develop relevant content, provide adequate facilities, use appropriate learning media and create supportive learning activities.

Realising the importance of developing science literacy since elementary school and the role of teachers in optimising it, researchers are interested in analysing the science literacy profile of PGSD students at Karimun University. This research is entitled “Analysis of Ethnobotanical Knowledge Science Literacy Profile in PGSD Students: Case Study of Karimun Akit Tribe Medicinal Plants”.

METHODS

The method used in this research is a survey method with quantitative descriptive analysis. This research was

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conducted at the Faculty of Teacher Training and Education (FKIP), Karimun University from May to July 2024. The population in this study were students of the Elementary School Teacher Education (PGSD) study programme with the sample being students in semester 2, 4 and 6 totalling 39 people. The sampling technique was purposive sampling.

The instrument used is a science literacy question in the form of multiple choices totalling 20 questions about the study of ethnobotanical knowledge of PGSD students about medicinal plants used by the Karimun Akit tribe developed by researchers by reviewing aspects of scientific literacy competencies, namely explaining phenomena scientifically, interpreting data and evidence scientifically, and evaluating and designing scientific investigation (PISA, 2015).

The data collection technique was carried out by giving a science literacy instrument test to the research sample. The data obtained from the test results were then analysed based on the indicators of science literacy achievement, with the calculation of the scores obtained and the score provisions can be seen as follows.

$$\text{Score} = \frac{\text{Score obtained}}{\text{Maximum score}} \times 100\%$$

Furthermore, the data were analysed descriptively, namely to determine the profile of science literacy of PGSD students on ethnobotanical studies of medicinal plants of the Karimun Akit tribe. The classification of the level of science literacy on this ethnobotanical study can be seen in Table 1[16].

TABLE 1. Classification of science literacy levels for ethnobotanical studies

Score	Category
86 – 100	Very good
72 – 85	Good
58 – 71	Enough
43 – 57	Low
≤ 43	Very low

RESULTS AND DISCUSSION

This study analyses the science literacy skills of PGSD students at Karimun University in learning science on kingdom plantae material, namely ethnobotanical studies of medicinal plants used by the Karimun Akit Tribe. This analysis was carried out to determine the scientific literacy skills of PGSD students on this material. Students' science literacy skills can be seen from the results of the science literacy test conducted by students. The average score of the overall science literacy test results was 55.64 in the low category. Furthermore, the percentage of data on student science literacy test results can be seen in Figure 1.

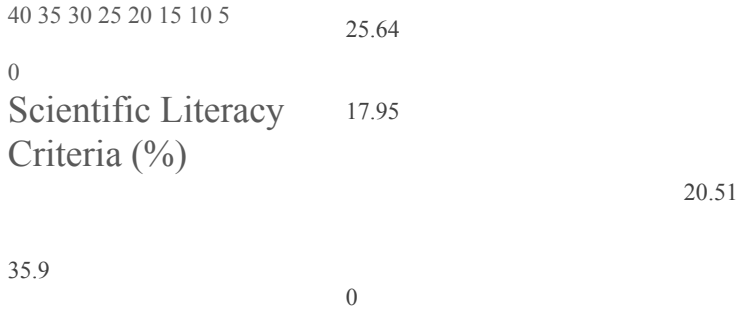

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FIGURE 1. Percentage of Scientific Literacy Criteria

From the percentage results in Figure 1, it can be seen that the analysis of student science literacy shows the value from the highest to the lowest percentage in order, namely for the low category with a total of 14 students (35.9%), the moderate category with a total of 10 students (25.64%), the very low category with a total of 8 students (20.51%) and the good category with a total of 7 students (17.95%). The lack of interest in reading among students contributes to their low memory when working on science literacy questions. When students have weak initial understanding in explaining science phenomena, they will have greater difficulty in analysing, evaluating and drawing conclusions from science literacy questions. In addition, teachers still lack the application of science literacy aspects in learning. Therefore, students need to be familiar with the application of science literacy, read the material to be learned, and practice with contextual questions that are relevant to the real life around them.

The low level of science literacy is caused by many factors including students only remembering the material taught by the teacher without really understanding, applying or revisiting the material[17] and low student interest in reading, learning that is not relevant to the context, students' misunderstanding in understanding and analysing the science literacy questions they work on[18], evaluation tools that have not been focused on developing science literacy, and limited teacher mastery in teaching science literacy[19]. In addition, there are other inhibiting factors such as the education system in schools, the selection of models, approaches, methods, learning strategies, learning resources, facilities and infrastructure, as well as assessment and evaluation that do not support the development of science literacy[20]. Some of these factors cause not all students have good science literacy skills. Based on interviews with students, they only copy the material given by lecturers without re-reading after the lecture ends. Meanwhile, interviews with lecturers revealed that science literacy has not been fully implemented in the lecture process, especially in the basic concepts of elementary biology course. Information about students' science literacy skills and the obstacles faced in schools is very important for teachers to overcome educational problems. In addition, analysis of the achievement of science literacy aspects or indicators can also be done through science literacy tests.

The results of the science literacy test can also be seen from the achievement of the main competencies of science literacy. The achievement of these key competencies is presented in Table 2.

TABLE 2. Percentage of science literacy competence

Science Literacy Competence	Percentage (%)
The ability to explain phenomena scientifically	40.55
The ability to interpret data and evidence scientifically	31.80
The ability to evaluate and design scientific investigations	27.65

Based on the research results shown in Table 2, it can be seen that the value of the first science literacy competency, namely the ability to explain phenomena scientifically, obtained a percentage of 40.55% with a very low category, the competency of the ability to interpret data and evidence scientifically obtained a percentage of 31.80% with a very low category and the competency of the ability to evaluate and design investigations obtained a percentage of 27.65% with a very low category. Of these three competencies, the competency of the ability to explain phenomena scientifically has the highest percentage because students find it easier to explain phenomena

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using the simple knowledge they have, compared to analysing the phenomena presented in the questions. In contrast, the competency of the ability to evaluate and design investigations received the lowest percentage because students still have difficulties in this matter. The difficulty is caused by students' tendency to only memorise theories and concepts presented by the teacher without trying to design from the concepts presented and apply them in everyday life, so they have difficulty starting to evaluate and design an investigation.

Table 2 shows that the first competency, namely explaining phenomena scientifically, has an average percentage of 40.55% which is classified as very low even though the three indicators of this competency get higher scores. This is due to students' less honed ability to find keywords relevant to the problem at hand[21]. In addition, students do not use their thinking skills when working on tasks, but only memorise information[8,22] and teachers often focus on memorisation when teaching, so it is important to teach meaningful learning so that students do not just memorise concepts[23]. Therefore, there is a need for a learning process that requires students to foster and develop their curiosity to answer any questions posed.

The percentage value of the second science literacy competency, namely the ability to interpret data and evidence scientifically, obtained a percentage of 31.80% in the very low category. This shows that students still do not have the ability to interpret data and evidence scientifically well, even though this ability is very important for them to have in the science learning process. Students have difficulty interpreting data scientifically because they are not accustomed to linking scientific contexts with everyday life, this has a relationship with obtaining a low percentage of competence in the ability to explain phenomena scientifically. When someone is able to interpret data, it means they have the ability to understand what is in the material, such as theories, concepts, facts and information[24]. In addition, in science literacy tests involving the competency of data interpretation ability, students answer quickly without providing scientific explanations that should be obtained from proper discourse reasoning. One of the causes of students' low science literacy is due to a lack of interest and reading habits[25].

Science literacy skills in evaluating and designing scientific research obtained the lowest score of the three science literacy competencies with a percentage of 27.65% in the very low category. The results of the analysis show that students' ability to conduct scientific research still needs to be improved because learning often emphasises memorisation rather than understanding that can be applied in the real world. Therefore, students' scientific abilities are still classified as low[26]. In addition, students do not conduct practical activities and do not master scientific investigation competencies, they do not have the ability to evaluate and design scientific research[27]. Therefore, there is a need for learning that emphasises students in the context of everyday life that can be integrated by doing simple practical activities so that it can train students in evaluating and designing their scientific research.

The science literacy skills obtained by students vary in each competency, with a very low category. The low level of science literacy is caused by the lack of application of knowledge in everyday life and the habit of students working on questions that focus on content, not on scientific reasoning as demanded by PISA science literacy questions[28]. In addition, the intensity of practicum also affects science literacy, where students who often do practicum show better science literacy competencies[29]. Learning that only emphasises memorisation without practical application makes it difficult for students to apply the knowledge gained in everyday life[30]. Therefore, appropriate learning strategies as well as efforts from teachers and students are needed to improve science literacy, including the honing of critical thinking skills, creativity, and communication skills[31]. Science literacy is important for student development and learning effectiveness, so it needs to be improved to achieve educational goals[32].

CONCLUSION

The results of this study indicate that the scientific literacy skills of PGSD students at Karimun University regarding ethnobotany studies of medicinal plants by the Akit Karimun Tribe have an average score of 55.64 with a low category. In addition, the results of student achievement in each scientific literacy competency obtained a very low category with percentage scores in sequence, namely: the ability to explain phenomena scientifically (40.55%), the ability to interpret data and evidence scientifically (31.80%), and the ability to evaluate and design scientific investigations (27.65%). Factors that influence this low scientific literacy competency include low reading interest, non-contextual learning, student learning styles and habits, lack of curiosity and teaching techniques of a teacher or lecturer. Efforts to improve low scientific literacy can be done by teaching scientific literacy continuously, compiling

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materials systematically, and planning the learning process using the right learning model.

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