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DEVELOPMENT OF A SCIENTIFIC LITERACY INSTRUMENT BASED ON RIAU MALAY ETHNOSCIENCE IN SCIENCE SUBJECTS

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Abstract : *The OECD announced that the science literacy scores of Indonesian students ranked 70th out of 78 participating countries, indicating that science literacy in Indonesia is in the low category. One effort that can be made to improve students' science literacy is by incorporating local wisdom into learning assessments. The aim of this research is to determine the validity, practicality, and effectiveness of a science literacy instrument based on Riau Malay ethnoscience. This study uses the R&D research method designed using the Plomp model. The application of the Plomp model involves three stages: the preliminary research phase, the prototyping phase, and the assessment phase. The research instruments used include questionnaires, observation sheets, interview sheets, and science literacy test instruments based on Riau Malay ethnoscience. The data analysis techniques consist of qualitative and quantitative descriptive data analysis. Based on the data analysis results, the validity level of the test items is 88.16%, which falls into the valid category. The practicality level is 92%, which falls into the practical category. In the effectiveness stage, a score of 47.21% was obtained, which falls into the moderate category. The conclusion of this research is that the science literacy instrument based on Riau Malay ethnoscience is considered valid, practical, and suitable for use in science education.*

Keywords : *Scientific Literacy; Ethnoscience; Instrument Based on Riau Malay.*

Abstrak : *Pihak OECD mengumumkan skor literasi sains siswa Indonesia berada pada urutan 70 dari 78 negara peserta yang menunjukkan literasi sains Indonesia berada pada kategori rendah. Salah satu upaya yang bisa dilakukan untuk meningkatkan literasi sains siswa adalah dengan melibatkan kearifan lokal pada assessmen pembelajaran. Tujuan penelitian ini adalah untuk mengetahui validitas, praktikalitas dan efektivitas instrumen literasi sains berbasis etnosains melayu Riau. Penelitian ini menggunakan metode penelitian Rnd yang dirancang menggunakan model Plomp. Penerapan model Plomp menggunakan tiga tahap yaitu tahap pendahuluan (preliminary research), tahap pengembangan (prototyping phase), dan tahap penilaian (assessment phase). Instrumen penelitian yang digunakan berupa lembar angket, lembar observasi, lembar wawancara, dan instrumen soal litersi sains berbasis etnosains melayu Riau. Teknik analisis data berupa analisis data deskriptif kualitatif dan kuantitatif. Berdasarkan hasil analisis data diperoleh tingkat validitas soal sebesar 88,16% berada pada kategori valid. Tingkat praktikalitas sebesar 92% berada pada kategori praktis. Pada tahap efektivitas didapatkan skor 47,21% berada pada kategori sedang. Kesimpulan dari penelitian ini didapatkan bahwa instrumen literasi sains berbasis etnosains melayu Riau tergolong valid, praktis, dan layak digunakan dalam pembelajaran IPA.*

Kata Kunci : *Literasi Sains; Etnosains; Instrumen Berbasis Melayu Riau.*

INTRODUCTION

Science is the study of phenomena through a series of processes known as the scientific method, which is built upon scientific attitudes. This approach ensures that the learning process is meaningful, enabling students to master and apply scientific knowledge and concepts effectively (Ayuni, 2021). The primary goal of science education is not only to impart theoretical knowledge but also to foster the ability to apply this knowledge in real-life problem-solving situations (Mukaffan et al., 2023).

The success of education is demonstrated when students can apply the knowledge they have acquired to solve everyday problems, one key aspect of which is scientific literacy (Pertiwi, 2019). Fostering scientific literacy in students can be achieved through science education. The Programme for International Student Assessment (PISA) defines scientific literacy as the ability to use scientific knowledge, identify questions, and draw conclusions based on evidence, in order to understand and make decisions regarding the natural world and the changes it undergoes due to human activity (Fauziyah et al., 2021; Hartono et al., 2021; Narut & Supradi, 2019).

Promoting scientific literacy is crucial in contemporary education as it equips students with the skills to engage critically with scientific information, make informed decisions, and understand the implications of science in their daily lives. Therefore, integrating scientific literacy into science education is essential for developing well-rounded, knowledgeable individuals who can contribute effectively to society (Husna et al., 2023).

The scientific literacy of students in Indonesia is influenced by various factors, including the curriculum and education system, the selection of teaching methods and models by teachers, learning facilities, learning resources, instructional materials, and others (Negeri et al., 2019). The areas of assessment and evaluation include reading literacy, mathematical literacy, and scientific literacy.

The Organisation for Economic Cooperation and Development (OECD) announced the 2018 PISA (Programme for International Student Assessment) scores for Indonesia in the domains of literacy, mathematics, and science (Hartono et al., 2021; Kasih, 2020; Pratama & Husnayaini, 2022). The results were presented by Yuri Belfali, Head of Early Childhood and Schools at OECD, to the Indonesian Minister of Education and Culture, Nadiem Makarim, at the Ministry of Education and Culture in Jakarta, ranking Indonesia 70th out of 78 participating countries. For nearly 20 years since PISA first released its global assessment results, Indonesia has consistently ranked low in terms of students' scientific literacy. This indicates that the quality of science education in Indonesia is significantly lower than that of OECD member countries (Fuadi et al., 2020).

One strategy to enhance students' scientific literacy is by incorporating local wisdom, or ethnoscience, from the Riau community into assessment and learning evaluation. Ethnoscience involves transforming indigenous community science into

scientific knowledge (Agustin et al., 2018). The purpose of integrating local wisdom into the learning process is to facilitate students' understanding of the material, as this wisdom is rooted in their immediate environment (Adnan et al., 2021; Haryanti et al., 2022; Ibnu & Tahar, 2021).

Studies on local wisdom in Riau have been extensively integrated into science education. Examples include "The Study of Ethnoscience in the Maauwo Tradition at Lake Bakuok as a Source of Biology Learning" (Ilhami & Yasnel, 2022), "Analysis of Local Wisdom in the Manongkah Kerang Tradition in Indragiri Hilir, Riau as a Source of Ethnoscience-Based Science Learning" (Ilhami et al., 2020), "Analysis of Local Wisdom in the Rumbio Customary Prohibited Forest as a Source of Science Learning (Case Study in Rumbio Village, Kampar District, Kampar Regency)" (Matsna, 2022), and "Analysis of Ethnoscience in the Bakaroh Tradition in Sungai Intan Village, Indragiri Hilir Regency as a Learning Medium" (Aulia et al., 2023). Such studies provide a foundational basis for implementing science education that incorporates local cultural elements.

The discussion revolves around the significance of incorporating local wisdom into scientific literacy instruments, particularly in the context of Riau Malay ethnoscience. By integrating elements of local culture and knowledge into the learning process, students can relate better to the subject matter and find it more engaging. This approach aligns with the principles of culturally responsive teaching, which emphasizes the importance of acknowledging and valuing students' cultural backgrounds in education (Haryanti et al., 2022; Nihwan & Widodo, 2020).

Moreover, ethnoscience-based learning and assessment cater to the social and cultural contexts within the community, making the educational experience more relevant and meaningful for students. It encourages them to explore and appreciate their cultural heritage while acquiring scientific knowledge and skills (Hadi, et al., 2020). This approach also fosters a sense of pride and identity among students, as they see their culture represented in the curriculum. The development of a scientific literacy instrument based on Riau Malay ethnoscience serves as a practical tool for teachers to assess students' understanding of scientific concepts. By incorporating local knowledge and traditions into assessment tasks, teachers can gauge students' comprehension in a way that is culturally sensitive and inclusive. This instrument provides a platform for students to demonstrate their knowledge and skills while honoring their cultural heritage.

Therefore, the integration of local wisdom into scientific literacy instruments offers numerous benefits for both students and educators. It promotes cultural appreciation, enhances student engagement, and provides a more holistic approach to learning. By recognizing the value of ethnoscience in education, we can create more inclusive and effective learning environments for all students.

METHOD

This study adopts a research and development (R&D) approach, focusing on the creation and evaluation of a specific product, in this case, a scientific literacy test instrument for junior high school science subjects based on Riau Malay ethnoscience. R&D methodology is employed to generate the desired product and assess its effectiveness (Baiti & Mardhiyana, 2019). The objective of this research is to produce a scientifically sound instrument tailored to the needs of seventh-grade SMP/MTs students.

The development of the scientific literacy instrument based on Riau Malay ethnoscience for seventh-grade SMP/MTs students is guided by a research design framework developed by Plomp. Plomp's development model comprises three primary stages: preliminary research, prototyping phase, and assessment phase (Sugiyono, 2019). Plomp (2010) emphasizes the necessity of a research design in development studies, characterizing educational design as a method through which individuals systematically work towards resolving created problems. Thus, the study employs a structured research and development process, following Plomp's model, to create and evaluate the effectiveness of a scientific literacy instrument rooted in Riau Malay ethnoscience for seventh-grade SMP/MTs students. This methodological approach ensures systematic progress towards the development of an instrument tailored to the specific educational context and student needs.

The research methodology employed in this study follows a structured process outlined by Rismanigsih (2010), consisting of three main phases: Preliminary Research, Prototyping Phase, and Assessment Phase. During the Preliminary Research phase, a comprehensive analysis of needs and contextual literature review is conducted to develop a conceptual and theoretical framework based on identified requirements and existing research. This phase serves as the foundation for subsequent stages by providing insights into the research context and identifying key areas of focus.

Moving on to the Prototyping Phase, the focus shifts towards the development and refinement of prototypes. This iterative process involves designing and developing the initial prototype, conducting formative evaluations, and refining the prototype based on feedback. Tessmer's formative evaluation framework is utilized, beginning with self-evaluation to produce Prototype 1. Subsequent iterations involve expert reviews, one-to-one assessments, and small group testing, culminating in the development of Prototype 4, deemed suitable for field testing. Additionally, practicality testing is conducted with science teachers to assess the usability of the instrument in real-world settings. The stages of formative evaluation can be seen in Figure 1.

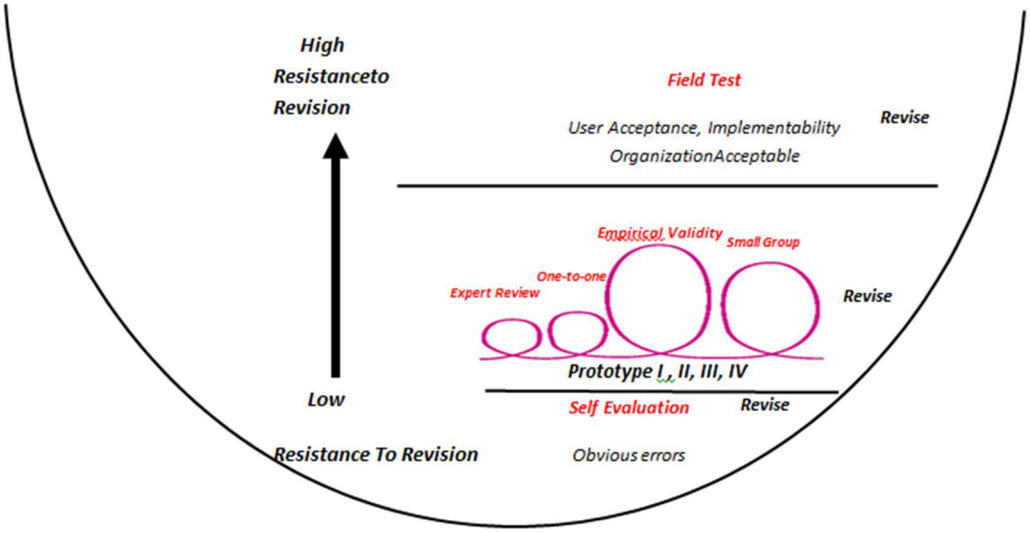

Figure 1: Formative Evaluation

Finally, in the Assessment Phase, Prototype 4 undergoes field testing to evaluate its effectiveness in enhancing students' understanding and its alignment with expectations. This phase involves testing the instrument with a group of students in a classroom setting to assess its practicality and effectiveness. The outcomes of this assessment serve as the basis for making informed decisions and planning further actions, including revisions if necessary. Overall, the Assessment Phase ensures the thorough evaluation and refinement of the instrument before its implementation, ensuring its effectiveness in achieving the desired research objectives.

RESULT AND DISCUSSION

The science literacy instrument based on Riau Malay ethnoscience developed in this research utilizes the Research and Development (R&D) method. This instrument, specifically designed for seventh-grade students in junior high schools (SMP/MTS), focuses on integrating Riau Malay ethnoscience into science literacy questions. The primary objectives of this study are to determine the validity, practicality, and effectiveness of the developed instrument. To ensure the product's validity, the instrument underwent evaluation by five experts: one language expert, two content/material experts, and two Riau Malay ethnoscience experts. Practicality testing was conducted by a science teacher from SMP Negeri 23 Pekanbaru, while the instrument's effectiveness was assessed through implementation in a seventh-grade class at the same school.

The validation process included various tests to evaluate the instrument's validity, reliability, difficulty level, discrimination power, and the effectiveness of distractors in the questions. These tests are crucial to ensure that the instrument is robust and provides accurate measurements of students' science literacy levels. The development of this

instrument aims to assist teachers in assessing students' science literacy and to help students comprehend science literacy questions that incorporate Riau Malay ethnoscience elements. Through the conducted research and development, the following results were obtained;

1. The Preliminary Research Stage

The preliminary stage of this research was conducted to identify and analyze the requirements needed for developing a Riau Malay ethnoscience-based science literacy instrument. Interviews with Mrs. TLN, a science teacher at SMP Negeri 23 Pekanbaru, revealed several challenges faced by teachers in creating evaluation questions, particularly in aligning the questions with students' abilities. Additionally, the school had never utilized Riau Malay ethnoscience-based science literacy questions in their learning evaluations or final exams, primarily due to a lack of awareness about the concept of ethnoscience. The evaluation questions used in the school were solely based on the available science textbooks and were updated once every two years. The Riau Malay ethnoscience-based science literacy instrument developed in this research can be used provided that students have undergone learning based on Riau Malay ethnoscience.

The preliminary stage of this research involved several key activities aimed at developing a Riau Malay ethnoscience-based science literacy instrument. One of the primary activities was curriculum analysis. During this phase, the syllabus of the science subject at SMP Negeri 23 Pekanbaru was thoroughly examined. The goal was to gain a comprehensive understanding of the seventh-grade science material and the learning outcomes outlined in the Core Competencies (KI) and Basic Competencies (KD). The insights gained from this analysis were critical for ensuring that the developed instrument was well-aligned with the existing curriculum and effectively addressed the specified learning objectives.

Another essential activity was the analysis of Riau Malay ethnoscience. This analysis aimed to determine whether the school had previously incorporated ethnoscience into its teaching or assessment practices. The purpose was to help students better understand science questions by integrating culturally familiar elements. The findings revealed that SMP Negeri 23 Pekanbaru had not yet implemented or linked learning with Riau Malay ethnoscience. Instead, the science teaching at the school was generally connected to everyday activities and the surrounding environment. Moreover, the teachers had never created science literacy questions based on Riau Malay ethnoscience.

According to Mrs. TLN, there is a significant need to develop a science literacy instrument based on Riau Malay ethnoscience. She emphasized that such an instrument would not only make the questions more engaging but also help uncover students' knowledge of local wisdom in Riau. This innovative approach is expected to enhance students' interest and understanding by linking scientific concepts with their cultural context, thereby enriching their overall learning experience.

The analysis of Riau Malay ethnoscience aimed to determine whether the school had previously integrated ethnoscience into its teaching or assessment processes. The objective was to facilitate students' understanding of science questions by incorporating familiar cultural elements. The findings indicated that SMP Negeri 23 Pekanbaru had not yet implemented or associated learning with Riau Malay ethnoscience; instead, the teaching was related to everyday activities and the environment. Teachers had never created science literacy questions based on Riau Malay ethnoscience.

2. Prototyping Phase

The prototyping phase of this research encompassed several critical stages in the development of the Riau Malay ethnoscience-based science literacy instrument. In the self-evaluation stage, the prototype was initially assessed and received a score of 83.33%, placing it in the "Highly Appropriate" category. Despite this positive evaluation, several vocabulary errors were identified in questions 1, 2, 3, 4, 9, and 39, necessitating revisions to enhance the instrument's accuracy and clarity.

Subsequently, the expert review stage as Figure 2, involved a thorough validation process by five experts: one language expert, two content/material experts, and two Riau Malay ethnoscience experts. The results from the validation survey indicated that the language aspect received an initial score of 80%, which improved to 86.66% in the second round, both categorized as "Highly Appropriate." The content/material aspect was rated at 82.22% in the first stage and reached 100% in the second stage, consistently falling into the "Highly Appropriate" category. The ethnoscience aspect was evaluated once and scored 92%, also in the "Highly Appropriate" category. Overall, the expert review yielded an average score of 88.16%, demonstrating the instrument's high suitability across all evaluated aspects.

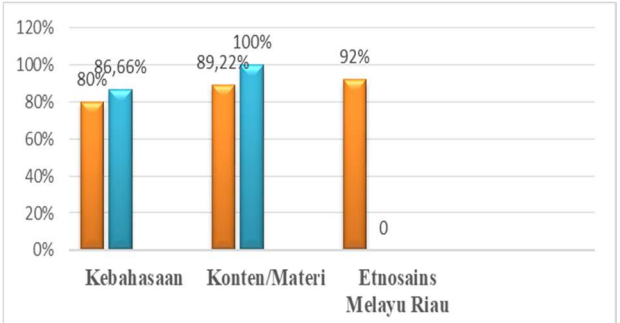

Figure 2: Expert Review Assessment

The one-to-one evaluation stage involved testing the instrument with three eighth-grade students from SMP Negeri 23 Pekanbaru. The results showed that the first student, SAP, who represented high-knowledge students, scored 82.85%, categorized as "Very Good." The second student, BAC, representing average-knowledge students,

achieved a score of 80%, categorized as "Good." The third student, MSP, who represented low-knowledge students, scored 77.14%, also in the "Good" category. These findings indicated that the instrument was effective and comprehensible for students with varying levels of knowledge. In the small group evaluation stage, the first empirical validity test as Figure 3, was conducted with 36 eighth-grade students, evaluating 40 questions for validity.

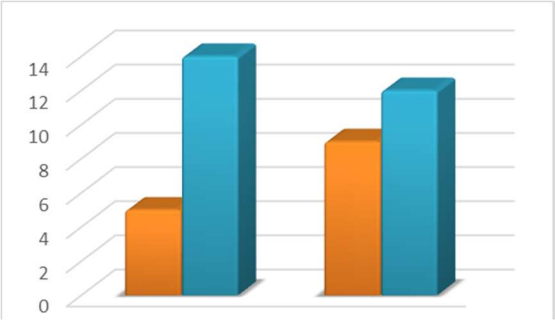

Figure 3: Validity Test of Instrument

The correlation analysis determined a question's validity based on whether the correlation value (r-hitung) exceeded the critical value (r-tabel) at a 5% significance level, where the critical value was 0.349. The reliability test, conducted using Anates V.4 software, revealed a reliability score of -0.44 for multiple-choice questions, categorized as very low, and 0.61 for essay questions, categorized as high. Consequently, the questions underwent revisions to enhance reliability for the second empirical validity stage.

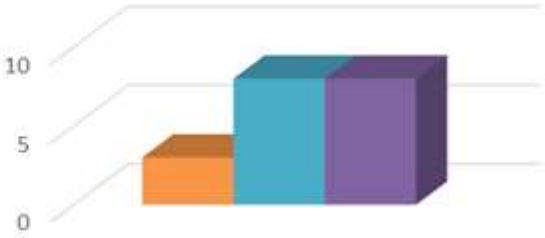

Figure 4: The Discrimination Power Test

The discrimination power test for multiple-choice questions as Figure 4, showed three questions in the "Good" category, eight in the "Moderate" category, and eight in the "Poor" category. This test was limited to multiple-choice questions due to software constraints. The difficulty level test as Figure 5, revealed 17 questions as "Very Difficult," six as "Difficult," 12 as "Moderate," two as "Easy," and three as "Very Easy." In the second empirical validity test, conducted with six students of varying abilities, four students fell into the "Practical" category, and two into the "Moderately Practical" category. The

reliability scores for multiple-choice and essay questions were 0.85 and 0.88, respectively, indicating that the instrument had achieved the necessary reliability and was ready for the next stage.

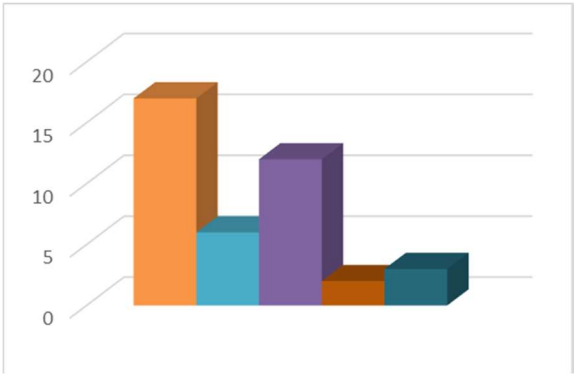

Figure 5: The Difficulty Level Test

Finally, the practicality evaluation by Mrs. TLN, a science teacher, showed an average score of 92% across all assessment aspects, categorized as "Highly Practical." She noted that the instrument would be more effective if Riau Malay ethnoscience-based learning was implemented in the school first, as students would find the questions easier to understand with prior exposure to the related content. Following these evaluations, the instrument was deemed ready for testing with seventh-grade students at SMP Negeri 23 Pekanbaru to assess their science literacy levels.

3. Assessment Phase

During the assessment phase, the performance of 32 seventh-grade students from SMP Negeri 23 Pekanbaru was evaluated using a Riau Malay ethnoscience-based science literacy test consisting of 25 questions. The analysis revealed varying levels of difficulty among the questions: six were categorized as very low, eight as low, five as medium, two as high, and four as very high. Overall, the students' average performance was 41.99%, which falls into the medium category. Detailed results for each competency aspect of science literacy are illustrated in Figure 6.

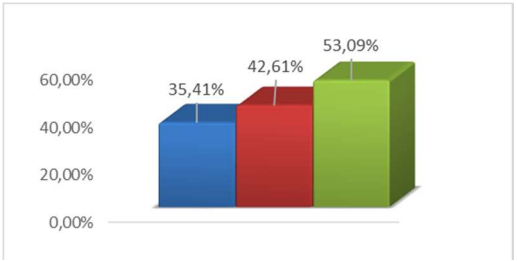

Figure 6: Percentage of Scientific Literacy

Following the competency assessment, the effectiveness of the science literacy instrument was evaluated based on the students' learning outcomes. Of the 32 students

who participated in this phase, two achieved high scores, 26 were in the medium category, and four were in the low category. The detailed performance data on the Riau Malay ethnoscience-based science literacy questions are shown in Figure 7.

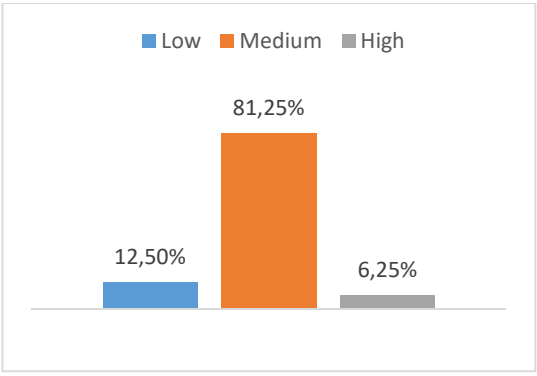

Figure 7: Average Achievement Results of Working on Riau Malay Ethnoscience-based Science Literacy Questions

The effectiveness assessment also involved a one-sample t-test to determine the statistical significance of the results. As presented in Table 1, the mean score for the students was 47.21, with a standard deviation of 10.453. A normality test was conducted to validate the results, shown in Table 2, which indicated that both the Kolmogorov-Smirnov (KS) and Shapiro-Wilk (SW) tests had significance values greater than $\alpha = 0.05$. Specifically, the KS test had a significance value of 0.190, and the SW test had a significance value of 0.333, confirming that the distribution of the students' scores was normal.

The hypothesis test results using a one-sample t-test are presented in Table 3. The test showed a significance value (1-tailed) of 0.000, which is less than $\alpha = 0.05$, leading to the acceptance of the null hypothesis. This means that the average science literacy score of the students was significantly lower than the benchmark score of 71. The students' average score of 47.21 indicates a medium level of science literacy.

Table 1: Average of Scientific Literacy Achievement

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
VAR00001	32	47.2188	10.45338	1.84791

In comparison, a study conducted by Guspandi in 2022 at SMP Negeri 23 Pekanbaru on the science literacy profile of middle school students in Pekanbaru city found that students' science literacy levels were generally low, with an overall score of 27.29% in the domains of context, competence, and knowledge. Several factors may contribute to these low scores. Firstly, the school had not previously implemented Riau

Malay ethnoscience-based science literacy learning. Secondly, disruptions due to home-based learning during the COVID-19 pandemic likely negatively impacted students' performance. The prerequisite test in the form of a normality test is presented in Table 2.

Tabel 2: Test of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
VAR00001	.129	32	.190	.963	32	.333

a. Lilliefors Significance Correction

Based on Table 2 above, both the Kolmogorov-Smirnov (KS) and Shapiro-Wilk (SW) tests have significance values greater than α = 0.05. Specifically, for the KS test, the significance value is 0.190 > 0.05 = α, and for the SW test, the significance value is 0.333 > 0.05 = α. These results indicate that the mathematical reasoning test scores are normally distributed. The hypothesis test used a one-sample t-test with the assistance of SPSS, as presented in Table 3.

Table 3: One Sample t-test

	Test Value = 71					
	t	df	Sig. (1-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
VAR00001	-12.328	31	.000	-22.78125	-26.5501	-19.0124

Based on Table 4.28 above, the significance value (1-tailed) is 0.000 < 0.05 = α, thus accepting the null hypothesis (H0). This means that the research hypothesis stating that the average science literacy score of students is less than 71 is accepted. In this case, the science literacy score of students at SMP Negeri 23 Pekanbaru falls into the medium category with a score of 47.21.

According to a study conducted by Guspandi in 2022 at SMP Negeri 23 Pekanbaru, titled "Analysis of the Science Literacy Profile of Middle School/MTs Students in Pekanbaru City," it was found that the science literacy level of middle school students in Pekanbaru City was in the low category with an overall score of 27.29% in the domains of context, competence, and knowledge. Several factors may contribute to low science literacy scores at a school. Firstly, the school may have never implemented Riau Malay ethnoscience-based science literacy learning. Secondly, disruptions due to home-based learning during the COVID-19 pandemic likely negatively impacted students' performance.

The development of a science literacy instrument based on Riau Malay ethnoscience employs the Research and Development (R&D) method, tailored specifically for seventh-grade students in junior high schools (SMP/MTS). This innovative approach aims to integrate local cultural elements into science education, enhancing the relevance and engagement of science literacy questions. The study's main objectives are to assess the instrument's validity, practicality, and effectiveness, ensuring it is a reliable tool for both teachers and students. The development of a science literacy instrument integrating Riau Malay ethnoscience reflects a progressive approach to science education, aligning with contemporary educational theories. This study employs the Research and Development (R&D) method to create a tailored instrument for seventh-grade students in junior high schools (SMP/MTS), aiming to enhance validity, practicality, and effectiveness.

The integration of Riau Malay ethnoscience into science literacy questions represents a significant advancement in science education, aligning with the principles of culturally relevant pedagogy (CRP). CRP emphasizes the importance of connecting curriculum content with students' cultural backgrounds to enhance engagement and academic success, as emphasized by scholars like Ladson-Billings (1995) and Gay (2000). By incorporating local knowledge systems such as ethnoscience, educators can create learning experiences that resonate with students' lived experiences. This approach not only fosters a deeper understanding of scientific concepts but also cultivates a sense of cultural identity and relevance in the learning process. Moreover, integrating ethnoscience into science education helps bridge the gap between formal school science and indigenous knowledge systems, promoting a more inclusive and holistic approach to learning. Overall, the integration of Riau Malay ethnoscience into science literacy questions holds promise for enhancing students' engagement, understanding, and interest in science by making the curriculum more culturally meaningful and accessible.

The validation and development of educational instruments are critical components of ensuring the reliability and validity of assessments in educational research. This study follows established best practices in instrument development, aligning with similar research by Osborne et al. (2003). These studies underscore the significance of rigorous validation procedures to guarantee the accuracy and effectiveness of educational assessments. In this study, experts in language, content, and ethnoscience were engaged in the validation process to ensure that the instrument effectively measures science literacy while also considering cultural nuances. By incorporating diverse perspectives and expertise, the study enhances the credibility and applicability of the developed instrument, thereby contributing to the advancement of science education in culturally diverse contexts.

Practicality testing conducted by a science teacher from SMP Negeri 23 Pekanbaru is an essential aspect of the instrument development process. This phase highlights the significance of incorporating educators' perspectives to ensure that the instrument is practical and feasible for use in real classroom settings. The involvement of teachers in evaluating the usability of the instrument contributes to its alignment with existing

pedagogical practices and instructional strategies. Studies by Quro and Choiriyah (2021)) and Holbrook & Rannikmae (2009) emphasize the importance of considering teachers' input in educational instrument development to enhance its applicability and effectiveness. Through practicality testing, educators can provide valuable insights into how the instrument can be integrated into teaching practices and its potential impact on student learning outcomes. Therefore, by engaging teachers in the validation process, this study ensures that the developed instrument meets the practical needs of educators and is conducive to enhancing science literacy among seventh-grade students in SMP/MTS schools.

The assessment phase of the study offers valuable insights into the science literacy levels of seventh-grade students and evaluates the effectiveness of the developed instrument. These findings contribute to the broader understanding of science education and literacy, echoing contemporary research that emphasizes the significance of culturally relevant approaches in enhancing student outcomes. Studies by scholars like Lee and Owens (2004) and Aikenhead (2006) have highlighted the importance of integrating cultural perspectives into science education to make it more meaningful and accessible to students from diverse backgrounds. By incorporating Riau Malay ethnoscience into the science literacy instrument, this study aligns with these principles, aiming to foster deeper engagement and understanding among students.

Moreover, the comparison with Hidayah., et.al. (2019) study provides additional context to the findings, emphasizing the influence of various factors on students' science literacy levels. Guspandi's research sheds light on how instructional practices and external disruptions, such as those caused by the COVID-19 pandemic, can impact students' performance in science literacy assessments. This comparison underscores the need to consider contextual factors when interpreting assessment results and designing interventions to improve science education outcomes. It also highlights the potential of culturally relevant pedagogy, as exemplified by the integration of Riau Malay ethnoscience, to address these challenges and promote more equitable learning experiences for students in SMP/MTS schools.

Overall, the assessment phase of the study not only provides valuable data on students' science literacy levels but also reinforces the importance of culturally relevant approaches in science education. By acknowledging and incorporating students' cultural backgrounds and local knowledge systems into instructional practices and assessment tools, educators can create more inclusive and effective learning environments for all students, ultimately leading to improved science literacy outcomes.

The integration of Riau Malay ethnoscience into science education presents promising implications for educational practice. By incorporating local knowledge systems into the curriculum, educators have the opportunity to enhance student engagement, deepen their understanding of scientific concepts, and promote cultural awareness. This

approach not only enriches students' learning experiences but also fosters a sense of pride and connection to their cultural heritage. Moreover, by contextualizing scientific knowledge within familiar cultural contexts, students are more likely to develop a holistic understanding of science and its relevance to their lives.

Looking ahead, future research endeavors could delve into exploring the long-term effects of ethnoscience-based instruction on students' science literacy levels and their attitudes towards science. Longitudinal studies could track students' progress over time to assess the sustained impact of incorporating ethnoscience into the curriculum. By examining changes in students' scientific knowledge, skills, and dispositions, researchers can gain valuable insights into the lasting benefits of ethnoscience-based pedagogies.

Furthermore, comparative studies conducted across diverse cultural contexts hold significant potential for enriching our understanding of the generalizability and effectiveness of ethnoscience-based approaches. By examining how different cultural backgrounds influence students' engagement with and understanding of science, researchers can identify commonalities and unique challenges that shape educational outcomes. This comparative lens can inform the development of culturally responsive teaching practices that are adaptable to various educational settings. In conclusion, the integration of Riau Malay ethnoscience into science education not only holds promise for improving student learning outcomes but also contributes to fostering a more inclusive and culturally relevant approach to science education. Through continued research and collaboration, educators can harness the potential of ethnoscience-based pedagogies to create enriching and equitable learning experiences for students in SMP/MTS schools.

The research on the development of a science literacy instrument based on Riau Malay ethnoscience for seventh-grade students in SMP/MTS schools provides several implications grounded in educational theory such as that the incorporation of Riau Malay ethnoscience into the science literacy instrument aligns with the principles of culturally responsive pedagogy (CRP). This approach, as advocated by scholars like Ladson-Billings (1995) and Gay (2000), emphasizes the importance of connecting curriculum content with students' cultural backgrounds to enhance engagement and achievement. By integrating local knowledge systems into the assessment, the research demonstrates how educators can create culturally relevant learning experiences that resonate with students' lived experiences, thereby fostering deeper understanding and interest in science.

CONCLUSION

In this research, a science literacy instrument based on Riau Malay ethnoscience has been successfully developed and evaluated using the Research and Development (R&D) method. This instrument is specifically designed for seventh-grade students in junior high schools (SMP/MTS) with a focus on integrating Riau Malay ethnoscience into science literacy questions. The main objectives of this study are to determine the validity, practicality, and effectiveness of the developed instrument. Evaluation was conducted by

five experts, including a language expert, two content/material experts, and two Riau Malay ethnoscience experts, as well as practicality testing by a science teacher from SMP Negeri 23 Pekanbaru, and effectiveness testing through implementation in a seventh-grade class at the same school. The validation process involved various tests to evaluate the instrument's validity, reliability, difficulty level, discrimination power, and the effectiveness of distractors in the questions. The research findings indicate that the developed instrument has been shown to be valid and practical for use in measuring students' science literacy.

This study shows that the preliminary stage is crucial for understanding the needs and challenges in developing a Riau Malay ethnoscience-based science literacy instrument. The results of interviews with science teachers highlight the importance of integrating Riau Malay ethnoscience elements into evaluation instruments to enhance students' interest and understanding of science subjects. Furthermore, the prototyping phase involved evaluation by experts and testing with students, providing valuable feedback to improve the accuracy and clarity of the instrument. This evaluation also highlights the need for Riau Malay ethnoscience-based learning in schools so that students can better understand and answer questions.

The assessment phase shows that the instrument is effective in measuring students' science literacy. Although there is variation in the difficulty levels of the questions, the average performance of students indicates a medium category, indicating that the instrument can provide an accurate portrayal of students' science literacy levels. Additionally, comparison with previous studies by Guspandi highlights the importance of implementing Riau Malay ethnoscience-based learning in improving students' science literacy. The effectiveness assessment involved a one-sample t-test to determine the statistical significance of the results. The mean score for the students was 47.21, with a standard deviation of 10.453. The test showed a significance value (1-tailed) of 0.000, which is less than $\alpha = 0.05$, leading to the acceptance of the null hypothesis. This indicates that the average science literacy score of the students was significantly lower than the benchmark score of 71, placing the students' average score of 47.21 in the medium category.

Overall, this research provides a valuable contribution to the development of culturally relevant and effective evaluation instruments for use in science education contexts in junior high schools. By integrating Riau Malay ethnoscience elements, this instrument can enhance students' interest and understanding of science subjects and provide a more comprehensive picture of their science literacy levels.

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