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"LENTERA LEARNING MODEL: AN ANALYSIS OF PRACTICALITY IN SCIENCE LEARNING AMONG PGPAUD STUDENTS"

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Abstract

Early childhood science education plays an important role in developing a range of skills, including critical thinking, problem-solving, and a basic understanding of natural phenomena. However, science intructuin in higher education particularly in Early Childhood Teaher Education (PGPAUD) programs still often relies on convensional approaches that do not actively engage student. Therefore, this study aims to increase students involvement in the learning process so that they develop analytical and critical thinking skills and are better able to connect theory with real-world practice. The LENTERA learning model was designed to enhace student engagement in learning science for childhood education. Through a seven-stage learning syntax known as the 7 steps (introducing the problem, reviewing theory, proposing hypotheses, collecting data, analyzing data, drawing conclusions, and respoting result), this model is expected to improve students understanding of science concept as well as their pedagodical competence. This study employed a research and development (R&D) method focused on assessing the practicality of the LENTERA learning model. Practicality was evaluated using the Criterion-Referenced Assessment (PAP) and the result indicate that the model achieved a high practicality score

Keywords: *LENTERA Learning Model, Practicality, Science Education, Early Childhood Teacher Education, Early Childhood Education*

INTRODUCTION

Science education for early childhood plays a crucial role in fostering curiosity, critical thinking skills, and foundational understanding of natural phenomena. It serves as an initial foundation that shapes children's understanding of the world around them while cultivating scientific attitudes such as questioning, observing, and experimenting (French, 2004). The course *Science for Early Childhood* aims to instill basic scientific knowledge appropriate to children's developmental stages by emphasizing enjoyable learning principles and hands-on, experiential approaches (Worth et al., 2009).

Several studies indicate that integrating research findings as sources of instructional materials can positively influence the engagement of PGPAUD students in the learning process. For instance, studies conducted by Granjeiro (2019) and Aisyah et al. (2022) found

that students exposed to recent research findings within course materials demonstrated increased motivation and active participation in classroom discussions, as they felt more connected to current developments in scientific knowledge. Furthermore, incorporating research into course content can enhance students' understanding of more complex concepts, as they are provided opportunities to link theory with real-world practice (Ardimen & Gustina, 2018; Izza et al., 2025). This integration of research findings also sharpens students' analytical and critical thinking skills, as they are required to analyze research outcomes within the context of early childhood education.

To address these challenges, the Literacy and Research Exploration Learning Model (LENTERA) was developed, focusing on a research-based approach to science learning. Theoretically, this model emerged from the need to overcome science learning practices that still provide limited opportunities for students to critically explore ideas, connect experiences, and construct contextual and applicable understanding. The LENTERA model aligns with the principles of progressivism, social constructivism, and andragogy, which emphasize active, meaningful, collaborative learning that is relevant to student characteristics. The model consists of several main stages: (1) introducing problems, (2) reviewing theories, (3) formulating hypotheses, (4) collecting data, (5) analyzing data, (6) drawing conclusions, and (7) reporting research results. This approach aims to increase student engagement in the learning process, provide deeper learning experiences, and cultivate scientific thinking skills essential for early childhood education.

Practically, the development of the LENTERA model is relevant to the needs of science courses for prospective early childhood teachers, which require evidence-based practices through the utilization of research findings and scientific journals as learning resources. This approach is also aligned with higher education policies that emphasize the strengthening of critical thinking and problem-solving skills. Initial implementation through limited trials involving PGPAUD students showed high levels of perceived practicality, reinforcing the position of LENTERA as a viable solution for enhancing student engagement and improving the quality of science learning.

The analysis of the practicality of the LENTERA learning model is a key aspect of this study, aimed at assessing the extent to which the model can be effectively implemented in the *Science for Early Childhood* course at the higher education level. The practicality of a learning model refers to the ease with which it can be used by both lecturers and students, as well as its capacity to enhance students' understanding and skills in teaching science to young children.

The LENTERA learning model represents an innovation derived from Research-Based Learning (RBL), designed to improve pedagogical competence and student engagement among PGPAUD students in early childhood science courses. Unlike previous models, LENTERA directly integrates research findings into course materials, enabling students to comprehend research principles and recent scientific discoveries without conducting independent research.

The syntax of the LENTERA learning model functions as a structured sequence of instructional stages known as the 7M, namely: (1) introducing problems, (2) reviewing theories, (3) proposing hypotheses, (4) collecting data, (5) analyzing data, (6) formulating conclusions, and (7) reporting results. These stages are designed to guide students through a systematic learning process that mirrors research procedures without requiring direct involvement in conducting research. This approach is particularly suitable for early-semester students, supporting the gradual and contextual development of research literacy and related skills (Joyce et al., 2015).

A detailed framework of the LENTERA learning model is presented in Figure 1.

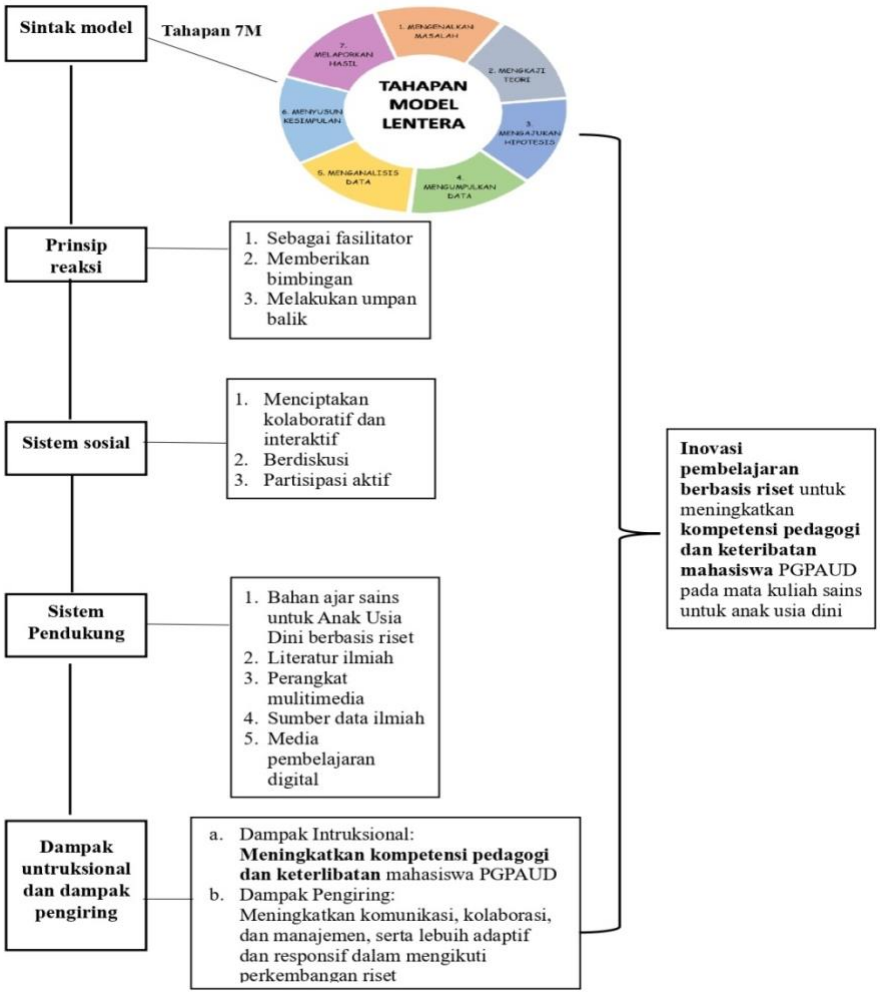

Figure 1. Framework of the LENTERA Learning Model

The *Science for Early Childhood* course aims to equip students with an understanding of fundamental scientific concepts as well as effective and enjoyable instructional methods for early childhood learners. The course content considered appropriate for implementing the LENTERA learning model includes strategies for early childhood science instruction, science learning resources, and issues encountered in early childhood science learning. The selection of these topics is based on their relevance to the research-based orientation of the model. An understanding of science teaching strategies enables students to develop instructional methods that align with the characteristics of early childhood learners, such as exploration and inquiry-based activities. Science learning resources are essential in supporting research-based learning, as they allow students to select and utilize appropriate references. Meanwhile, examining issues in early childhood science learning provides opportunities for students to identify existing challenges and to propose research-based solutions.

RESEARCH METHOD

This study employed a practicality evaluation method to assess the LENTERA learning model using the Criterion-Referenced Assessment (CRA) technique. CRA enables the evaluation of practicality based on predetermined score ranges (Kiswanto et al., 2024). The practicality test was conducted with PGPAUD students at higher education institutions, namely

STAHN Mpu Kuturan Singaraja and Dhyana Pura University. The practicality test involved 30 PGPAUD students. The sample was selected using purposive sampling, consisting of PGPAUD students who were enrolled in the *Science for Early Childhood* course and willing to participate in the entire testing process. Data on the practicality of the LENTERA learning model were collected through a student questionnaire. The questionnaire comprised five response items, with each item measured using a rating scale on a numerical scale ranging from 1 to 5. The use of a questionnaire facilitated the measurement of students' attitudes, opinions, and perceptions regarding the research subject. The response categories were defined as follows: 1 = Not appropriate, 2 = Less appropriate, 3 = Moderately appropriate, 4 = Appropriate, and 5 = Highly appropriate. The student response instrument was developed by operationalizing learning interactions that reflect research-oriented, research-led, research-tutored, and research-based learning approaches. This design enabled the measurement of students' responses regarding the implementation of the LENTERA learning model.

The data collected in this study were analyzed using descriptive quantitative analysis. To obtain practicality data for the developed product, namely the LENTERA learning model book, questionnaire data were analyzed using descriptive statistical techniques with the following formula:

$$NK = \frac{\sum X}{SMI} x\ 100\%$$ (Riduwan, 2007)

Note:
NK: Product Practicality Score
$\sum X$: Total score assigned by the observer
SMI: Maximum possible score that can be assigned by the observer

The criteria for determining the level of product practicality using Criterion-Referenced Assessment (CRA) are presented in Table 1 below.

Table 1. Criteria for Product Practicality Based on Criterion-Referenced Assessment (CRA)

No.	Persentase (%)	Practicality Category
1	81 – 100	Very Practical
2	61 – 80	Practical
3	41 – 60	Moderately Practical
4	21 – 40	Less Practical
5	0 – 20	Not Practical

(Sumber: Dantes, 2021)

The product is considered feasible if it achieves a minimum score of 80% with a good qualification. If this criterion is not met, the product must be revised based on the feedback and recommendations provided by the validators.

RESULTS AND DISCUSSION

RESULTS

The practicality of the LENTERA learning model was examined using descriptive statistical analysis with the Criterion-Referenced Assessment (CRA) method. CRA enables the interpretation of results based on predetermined score ranges, thereby facilitating the evaluation process. Product practicality was determined based on the average scores provided by validators or respondents, which were then categorized according to the applicable conversion guidelines. The results of the practicality testing are presented in Table 2 below.

Table 2. Results of the Practicality Test

Minimum Score	Maximum Score	Mean score	Practicality Percentage
17	54	33.68	81%

Table 2 presents the results of the practicality test of the LENTERA learning model based on the minimum score, maximum score, mean score, and practicality percentage obtained from respondents or specific testing procedures. Each element in the table provides important insights into the extent to which the tested LENTERA learning model can be effectively implemented within its intended context. The minimum score of 17 indicates that there were respondents who assigned the lowest rating to the practicality of the learning model. This score suggests that, in certain cases, the LENTERA learning model was perceived as less practical by a small number of respondents. Such perceptions may be influenced by several factors, including the complexity of implementation, difficulties in understanding the model, or limited alignment with users' needs.

Conversely, the maximum score of 54 indicates that some respondents perceived the LENTERA learning model as highly practical. This finding suggests that the model performs well in terms of ease of use, clarity of instructions, and efficiency of implementation. The maximum score demonstrates that a portion of users expressed a high level of satisfaction with the practicality of the model. The mean score of 33.68 provides an overall representation of respondents' perceptions regarding the practicality of the instrument. When considered alongside the range between the minimum and maximum scores, this mean value indicates that most respondents provided ratings that were moderate to positive, although individual variations were still present. The mean score can also be compared to the maximum score to determine whether the majority of respondents perceived the model as sufficiently practical or in need of further improvement. If the mean score is closer to the maximum score, it may be concluded that the LENTERA learning model is generally perceived as practical by most users. Conversely, if it is closer to the minimum score, further evaluation and refinement would be required to enhance its practicality.

The practicality percentage of 81% indicates that the tested LENTERA learning model falls within the practical category based on the assessment standards applied. In general, this percentage is obtained by comparing the mean score to the available score range and then converting it into a percentage scale. This value also suggests that approximately 81% of the assessed aspects met the practicality criteria of the LENTERA learning model, while around 19% of the aspects may still require refinement. In many evaluation studies, a practicality percentage above 80% is commonly regarded as an indicator that a learning model is sufficiently feasible for implementation in real instructional settings.

DISCUSSION

The design of the LENTERA learning model is grounded in the assumption that the primary challenge of science learning at the higher education level for PGPAUD students lies in the limited opportunities to critically explore ideas, connect personal experiences, and develop contextual and applicable understanding. As an approach focused on fostering critical thinking and problem-solving skills, the model is supported by key principles derived from educational theories such as progressivism, social constructivism, and andragogy, which emphasize the relevance of learning materials, learner autonomy, and the relationship between learners' experiences and the learning process (Fitri et al., 2022; Pramudya et al., 2023; Suharyani et al., 2025). The integration of these theoretical foundations positions LENTERA

as a student-centered, contextual learning model grounded in authentic scientific practice and exploration.

Learning in higher education, particularly for prospective early childhood teachers, needs to be research-based. This implies that instructional processes should not rely solely on textbook content but should also incorporate recent research findings from scientific journals as primary learning resources. Such an approach not only broadens students' perspectives on contemporary issues in early childhood education but also fosters scientific literacy, critical thinking, and sensitivity to evidence-based practice. Consequently, classroom instruction becomes a dynamic space in which students do not merely receive information but actively construct knowledge through exploration and reflection on scientific findings.

Previous studies by Granjeiro (2019), Maulidya et al. (2015), and Khumraksa (2021) emphasize that research-based learning can enhance students' motivation, engagement, and conceptual understanding. Learning syntaxes that follow the structure of scientific inquiry have been shown to positively influence the development of critical thinking skills and contextual lesson planning among prospective teachers. These stages reflect the principles of inquiry-based learning and research-based learning, where instruction is built upon authentic experiences and scientific reflection—two elements proven to promote active engagement and deeper conceptual understanding (Hmelo-Silver, 2004).

From its inception, the LENTERA model was designed using a theoretically robust and contextual framework that integrates constructivist theory and principles of andragogy. All components of the model—including the 7M syntax, social system, support system, principles of reaction, instructional effects, and accompanying effects—are systematically and coherently organized. The emphasis on direct experience in science learning constitutes a core principle of the LENTERA model. Through the structured 7M syntax, students are provided with opportunities to explore and develop knowledge independently rather than relying solely on theoretical explanations. This process supports the development of stronger pedagogical competence, as students are trained to design and implement contextual, evidence-based instructional strategies.

The high validity results not only confirm the quality of the model's content and structure but also indicate that the model effectively addresses the holistic learning needs of the PGPAUD study program. This holistic approach aligns with the perspective of Joyce et al. (2015), who assert that an effective learning model must encompass a well-defined syntax, social system, principles of reaction, and support system that operate synergistically. This view is further supported by Shulman and Suzanne M. Wilson (2004), who emphasize that a sound learning model must not only be theoretically valid but also capable of responding to practical and contextual educational demands.

The practicality test results of the LENTERA learning model, analyzed using the Criterion-Referenced Assessment (CRA) method, yielded a mean score of 33.68, with a maximum score of 54 and a minimum score of 17, which were converted into a practicality percentage of 81%. These findings indicate that the LENTERA learning model falls within the practical category and is feasible for implementation in higher education learning processes, particularly for undergraduate PGPAUD students in the *Science for Early Childhood* course. The practicality test results suggest that the model is not only theoretically well designed but also effectively implementable in real instructional settings. The percentage indicates that both lecturers and students can use the model with relative ease, without encountering significant obstacles related to understanding the syntax, alignment of instructional materials, or the overall flow of learning activities.

However, although the practicality test results indicate that the model is generally practical, variations in user perceptions were identified. The minimum score of 17 in the

practicality test suggests that a small proportion of users experienced difficulties in implementing the model. These challenges were primarily related to the complexity of the syntax, which requires a deep understanding of scientific processes such as problem formulation, literature review, and data analysis. This finding indicates that the practicality of a learning model is not always uniform and may depend on users' characteristics and academic readiness, including both students and lecturers. This observation is consistent with Michael and Richard (2006), who emphasize that the effectiveness of research-based learning is strongly influenced by learners' initial readiness, particularly in terms of academic literacy and higher-order thinking skills.

Regardless of how well a learning model is designed, it will not have a significant impact if it is difficult to implement in practice. In the context of higher education, practicality serves as a key indicator, given that PGPAUD students require learning experiences that are systematic yet flexible, and that do not impose excessive technical or conceptual burdens. These findings also suggest that the LENTERA learning model provides sufficient space for the adaptation of research-based learning within classroom instruction, without compromising time efficiency, active engagement, or alignment with the characteristics of PGPAUD students as adult learners. In accordance with the Regulation of the Minister of Education, Culture, Research, and Technology of the Republic of Indonesia No. 53 of 2023, higher education curricula are required to facilitate contextual and collaborative learning experiences that strengthen critical thinking and problem-solving competencies, all of which are reflected in the LENTERA learning model.

The integration of instructional syntax, teaching materials, and a supportive social system positions LENTERA as a flexible yet structured learning model—characteristics that are essential for PGPAUD students as adult learners. In this regard, the LENTERA model is not only technically practical but also philosophically aligned with the direction of higher education reform in Indonesia. Furthermore, the practicality findings are consistent with the study by Granjeiro (2019), which reported that research-based learning models tend to demonstrate high practicality when designed with systematic flows and grounded in authentic learning experiences. This is evident in the design of the LENTERA learning model, which integrates experiential learning activities, data exploration, and simplified yet comprehensive scientific reporting. The practicality assessment is further supported by successful implementation during the limited trial phase, in which users were able to follow all stages of the learning process effectively. This finding aligns with the concept of user-centered design in development research, which emphasizes the importance of user involvement in evaluating the practicality of educational products (Branch, 2010).

Studies by Wardani et al. (2024) and Mmassy (2024) also indicate that research-based learning requires self-regulated learning skills that may not be equally developed among all students. Student engagement encompasses multiple dimensions, including active participation in classroom discussions, contribution of feedback, punctuality, and initiative in seeking additional information. The LENTERA learning model, designed around active learning and self-reflection, fosters an engaging learning environment. In line with this, Kiljunen et al. (2024) argue that inverted or flipped learning structures position students as central agents in the learning process, thereby encouraging higher levels of engagement.

Overall, although the LENTERA learning model has been demonstrated to be practical for implementation in higher education settings, particular attention must be given to students' readiness to adopt research-based learning approaches. By providing adequate training and instructional support, the model can be more readily accepted by students and yield greater impacts on their pedagogical competence and critical thinking skills. The LENTERA model is not only technically effective but also philosophically relevant to the needs of higher education

in Indonesia, particularly within curricular frameworks that emphasize the development of critical thinking, problem-solving, and collaborative learning competencies.

CONCLUSION

Based on the results and discussion of the practicality analysis of the LENTERA learning model, a practicality percentage of 81% was obtained, indicating that the LENTERA learning model is highly practical for implementation in the learning process. Most features of the model met the functional criteria required for use in authentic instructional contexts. From a practical perspective, LENTERA provides implementable guidance for lecturers and educators in designing more participatory and contextual science instruction, as students are not only exposed to scientific concepts but also experience the scientific process in a gradual and structured manner. Therefore, this study contributes added value for practitioners in PGPAUD education by offering an alternative learning model that is easy to use and supports evidence-based learning.

However, this study has several limitations. First, it focused solely on evaluating the practicality of the model through a limited trial involving 30 PGPAUD students, which restricts the generalizability of the findings to a broader population. Second, the study did not examine the effectiveness of the model in improving learning outcomes, critical thinking skills, or problem-solving abilities through experimental methods. Accordingly, future research is recommended to expand the scope of evaluation of the LENTERA learning model to maximize the outcomes and insights gained from its implementation.

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