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Reflection of teachers' pedagogical competence in Daik Lingga Regency: An analysis

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ABSTRACT

This study analyzes the pedagogical competence profile of teachers in Daik Lingga Regency, an archipelago region in Indonesia, to inform contextual professional development. Using a sequential explanatory mixed-method design, it first quantitatively analyzed Training Needs Assessment (TNA) data from 804 educators against the national Teacher Competency Model (2023). Results indicate that overall pedagogical competence ranges from Level 3 (Evaluating) to Level 4 (Proficient). However, a critical disparity was found: competence in "Adaptive use of ICT" (sub-indicator 1.2.5) scored lowest (mean 2.980, Level 3), identifying it as a top training priority. In contrast, "Creating a safe and comfortable learning environment" (sub-indicator 1.1.3) scored highest (mean 3.420, Level 4). The low ICT score empirically validates contextual challenges related to infrastructure and connectivity in this island region. This quantitative finding triggers the subsequent qualitative phase to explore the underlying hindering factors. The study concludes that data-driven policy is crucial, recommending targeted professional development focused on adaptive digital skills to address the specific gaps and improve educational quality in Indonesia's outermost regions.

INTRODUCTION

Pedagogical competence is the core of teacher professionalism and a direct determinant of the quality of the learning process and outcomes for students globally (Ganendra et al., 2025). These competencies include curriculum design, learning strategies, and meaningful assessment for students (Lenske et al., 2016). However, in an ever-changing educational landscape, mastery of pedagogical competencies is not enough without critical self-reflection skills. Reflection has been recognized as a key mechanism for promoting continuous professional growth and improving teaching effectiveness (Brunetti et al., 2020; Narotama, 2021; Zou et al., 2025). Therefore, reflection is not an additional practice, but an integral part of the development of contextual and dynamic pedagogical competencies.

In island regions such as Daik Lingga Regency, the development of pedagogical competencies faces complex structural challenges. Limited educational infrastructure, transportation, and access to basic services remain major obstacles, especially at the secondary education level (Tan, 2021; Utomo et al., 2025). The socioeconomic conditions of coastal communities, including relatively high poverty rates, also have an impact on educational sustainability and student participation (As'ari et al., 2025; Sarier & Uysal, 2022; Yan et al., 2022). In addition, local socio-cultural practices shape community expectations of schools and the role of teachers, thereby influencing the pedagogical approaches used (Mahuri et al., 2023). In this context, teachers' pedagogical reflection becomes increasingly important in order to adapt learning practices to local realities.

Previous studies have shown that reflective practices contribute significantly to improving teachers' professional competence. Structured reflection has been proven to support teachers in becoming lifelong learners and improving the quality of learning (Rokhman Purnama et al., 2025). Collaboration through reflective dialogue and peer observation also plays a role in deepening reflection and encouraging more student-centered learning (Kamali & Javahery, 2025). In addition, systematic reflection is positively correlated with teachers' self-efficacy and professional behavior (Ketheeswaren,

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2025). However, other studies show that many teachers and prospective teachers are still at a shallow level of reflection despite having undergone structured training (Ayunda et al., 2023; Gemmink et al., 2021).

The quality of teacher reflection is greatly influenced by the institutional context and organizational support. Administrative and school leadership support plays an important role in facilitating sustainable reflective practices (Tosun & Bozkurt, 2024). Conversely, negative interpersonal dynamics and oppressive policies can hinder meaningful reflection (Petty et al., 2023). Access to structured and collaborative professional development programs has been shown to be effective in improving teachers' reflective abilities (Logan et al., 2025). These findings confirm that pedagogical reflection does not stand alone but depends on a supportive educational ecosystem.

Although the importance of teacher reflection has been widely discussed, there is a significant research gap in the context of disadvantaged island regions. Previous studies have not sufficiently explored the depth and nuances of teacher self-reflection in areas such as Daik Lingga Regency. The specific areas of pedagogical competence that are most challenging for teachers in the island context have rarely been mapped empirically.

Furthermore, the geographical, infrastructural, and cultural factors that influence teacher reflection have not been widely analyzed from the teachers' own perspective. This gap limits the formulation of evidence-based and contextual policy and professional development programs. The novelty of this study lies in its focus on the reflection of teachers' pedagogical competencies in island regions with distinctive geographical and sociocultural characteristics.

This study integrates quantitative analysis of teachers' self-reflection through Training Needs Assessment with qualitative exploration of the underlying contextual factors. This approach allows for more precise mapping of the strengths and weaknesses of teachers' pedagogical competencies in the local context. Thus, this study not only measures competency levels but also explains the reasons behind these achievements.

Contributorily, this study provides relevant empirical evidence for the development of education policy in island regions. The findings of this study are expected to form the basis for the design of contextual, adaptive, and sustainable teacher professional development programs. Therefore, this study aims to analyze the reflection of teachers' pedagogical competence in Daik Lingga Regency, identify sub-competencies with the highest and lowest levels of mastery, and explore contextual factors that influence this reflection. Through a sequential explanatory mixed method approach, this study is aimed at supporting the continuous improvement of learning quality in island regions.

RESEARCH METHODS

Research Design

This study used a mixed method with a sequential explanatory design. This design was implemented through two consecutive phases, namely a quantitative phase followed by a qualitative phase. In the first phase, quantitative data were collected and analyzed to map the profile of teachers' pedagogical competence. The results of the quantitative analysis were then used as the basis for designing qualitative data collection in the second phase, which aimed to explain the main findings in greater depth. This approach allowed for the integration of numerical and narrative data to obtain a comprehensive understanding of the phenomenon under study.

Population and Sample

The research population included all teachers in Daik Lingga Regency who had participated in teacher competency reflection activities through the Kemendikdasmen digital platform. In the quantitative phase, total sampling was used for all available reflection data, namely 804 educators and educational personnel who completed the 2024 Training Needs Assessment (TNA). In addition, supporting data in the form of learning.id account activity was also analyzed in aggregate to provide context for teacher digital participation. In the qualitative phase, participants were selected using purposive sampling, with the criterion being teachers who scored low on sub-indicator 1.2.5 (Adaptive Use of ICT), making them relevant to the focus of the research.

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Data Collection Techniques

The main quantitative data was obtained from the Teacher Competency Reflection TNA document sourced from the Ministry of Education and Culture's digital platform in 2024. This data contains the results of teachers' self-reflections on the sub-indicators of pedagogical competence referring to the 2023 Teacher Competency Model. In the qualitative phase, data was collected through semi-structured in-depth interviews with 15 selected teachers from various education levels. In addition to interviews, this study also used analysis of education policy documents and contextual secondary data, including the Riau Islands Province ICT Development Index (IP-TIK) and data from the *belajar.id* account activation dashboard, to enrich the interpretation of the findings.

Data Analysis Techniques

Data analysis was conducted in accordance with the two research phases. In the quantitative phase, TNA data was analyzed using descriptive statistics to calculate the distribution of competency levels and average scores for each pedagogical competency sub-indicator. These average scores were then interpreted to determine teacher competency levels and professional development priorities based on the Teacher Competency Model Operational Guidelines. This analysis was also used to identify critical sub-indicators that required further exploration in the qualitative phase.

In the qualitative phase, interview data were analyzed using thematic analysis following the Braun and Clarke (2006) model as referenced in Remmen (2024). The analysis process included data familiarization, initial coding, theme searching, theme review, and theme definition and naming. To increase the credibility of the findings, the coding and theme setting processes were validated through discussion and agreement with two fellow researchers. The results of the qualitative analysis were then used to explain and deepen the quantitative findings, particularly regarding the contextual factors that influence teachers' reflection and mastery of pedagogical competencies in the archipelago.

RESULTS AND DISCUSSION

Data analysis of the Training Needs Assessment (TNA)

Reflection on Teacher Competency in 2024 involving 804 educators in Daik Lingga Regency from data on 2.870 teachers from various levels. The data was interpreted academically based on the Competency Level in the 2023 Teacher Competency Model and the specified percentage range can be seen in Table 1.

Table 1. TNA Sub-Indicators of Teacher Competency Levels in Daik Lingga Regency

No	Sub-Indicator	Sub-Indicator Level					Number Of Respondents	Total (b x f)	(Column h): (Respondents)	(Column I: 5) x 100	Training Priority
		1	**2**	**3**	**4**	**5**					
1	1.1.1	11	108	464	221	0	804	2503	3.113	62.26	Level 4
2	1.1.2	4	85	436	279	0	804	2598	3.231	64.63	Level 4
3	1.1.3	2	37	386	379	0	804	2750	3.420	68.41	Level 4
4	1.2.1	3	88	536	177	0	804	2495	3.103	62.06	Level 4
5	1.2.2	5	101	457	241	0	804	2542	3.162	63.23	Level 4
6	1.2.3	6	78	501	219	0	804	2541	3.160	63.21	Level 4
7	1.2.4	4	44	445	311	0	804	2671	3.322	66.44	Level 4
8	1.2.5	12	171	442	179	0	804	2396	2.980	59.60	Level 3
9	1.3.1	12	105	476	211	0	804	2494	3.102	62.04	Level 4
10	1.3.2	8	84	527	185	0	804	2497	3.106	62.11	Level 4
11	1.3.3	3	78	496	227	0	804	2555	3.178	63.56	Level 4
12	1.3.4	10	115	469	210	0	804	2487	3.093	61.87	Level 4
13	1.3.5	14	126	462	202	0	804	2460	3.060	61.19	Level 4

Source: TNA Reflection on teacher competency 2024

Table 2. TNA Description Sub-Indicator Average Level Range

$0 < x \leq 20$	Level 1	Training is Very Necessary
$20 < x \leq 40$	Level 2	
$40 < x \leq 60$	Level 3	
$60 < x \leq 80$	Level 4	Training is Necessary
$80 < x \leq 100$	Level 5	Training is Recommended

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Phase II: Qualitative Analysis

Qualitative Findings Contextual Explanation Reflection on Teacher Competence

Qualitative findings that serve as a contextual explanation of TNA data show that, in general, the pedagogical competence of teachers in Daik Lingga Regency is at Level 4 (Proficient) in most sub-indicators. The main strength of teachers was most prominent in their ability to create a safe and comfortable learning environment (sub-indicator 1.1.3), which received the highest average score of 3.420 or 68.41 percent. Nearly half of the respondents were at Level 4, while only a very small portion were at Level 1, indicating the teachers' strong collaborative capacity in building a humanistic and supportive learning climate. In addition, the aspects of assessment, feedback, and reporting (indicator 1.3) also showed high consistency, with all sub-indicators reaching Level 4 with relatively stable average scores. These findings confirm that teachers have sufficient competence in designing and implementing assessments, providing feedback, and managing learning outcome reporting in a pedagogical manner.

On the other hand, the analysis also revealed critical areas that need to be prioritized for development, particularly in the sub-indicator of adaptive use of ICT (1.2.5), which only reached Level 3 with an average score of 2.980 or 59.60 percent. The majority of teachers are still at the intermediate level, while the proportion of teachers who have reached Level 4 is relatively limited, indicating a gap between knowledge and the innovative application of ICT in learning. A similar pattern was also seen in the sub-indicator of instructional design to foster interest and critical thinking (1.2.4), which, although it had reached Level 4 on average, most teachers were still at Level 3. These findings indicate that teachers have adequate conceptual understanding but still need support to strengthen reflective and adaptive implementation in learning practices. Thus, these qualitative results clarify that the main challenge does not lie in the aspects of humanistic pedagogy or assessment, but rather in strengthening teachers' adaptive capacity to integrate ICT and critical learning strategies contextually.

Contextual Analysis of Policy Support and Digital Infrastructure Teacher Competency Reflection

1. Policies and regulations for teacher competency reflection programs

Teacher competency reflection refers to the Teacher Competency Model (Perdirjen GTK No. 2626/B/HK.04.01/2023), which covers four main areas of competency. This reflection process is supported by the One Data Indonesia (SDI) Policy regulated in Presidential Regulation No. 39 of 2019 and further elaborated in the field of education in Permendikbudristek No. 31 of 2022. In practice, the One Data Education policy is implemented through a Single Sign-On (SSO) system that allows teachers to access various educational platforms with just one login using their belajar.id account.

2. Support for digitalization transformation

The level of utilization of regional learning account activation can be seen from the regional learning account activation dashboard for teachers in Bintan Regency. The account acts as an SSO authentication mechanism that allows users of the belajar.id domain to access various digital service applications, as shown in Figure 1.

Figure 1. Regional learning account activation dashboard
Source: https://lookerstudio.google.com/u/0/reporting/caa6b143-78e5-4163-8494-ee809d822b1e/page/p_389u6sl11c

Teacher accounts with the domain *belajar.id* are an implementation of Indonesia's one data policy. The number of teacher accounts available at the elementary, preschool, junior high, senior high,

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vocational, equivalency, and special education school levels in Daik Lingga Regency registered in Dapodik is 2.258, with 2.118 accounts activated. These are accounts that have not only been verified but have also logged in and used the *belajar.id* services (e.g., logging into the platform, accessing materials, or participating in digital activities). The activation rate of belajar.id accounts is 93.88%. This percentage is calculated from the ratio between the number of activated accounts (2.118) and the number of registered accounts (2.258). This data indicates the important role of teachers as the center of digital activities in the Daik Lingga Regency.

3. ICT Support in the Riau Islands Region

Based on the analysis of the ICT development index (IP-TIK) of the Riau Islands Province in 2022 and 2023, as shown in Figure 2.

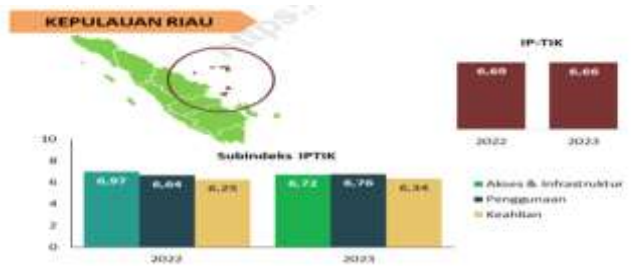

Figure 2. ICT Development Index of the Riau Islands Region
Source: https://assets.dataindonesia.id/2024/12/12/1733992082394-5-12.-indeks-pembangunan-teknologi-informasi-dan-komunikasi-2023.pdf

Based on an analysis of the ICT Development Index (IP-TIK) for the Riau Islands Province in 2022 and 2023, this study identifies a positive trend in digital infrastructure development in the archipelago. Although the changes that have occurred are relatively small, this improvement reflects the commitment of the local and central governments to strengthening access to and the quality of information and communication technology (ICT) services as the foundation of modern education (Sari et al., 2024). This positive trend is highly relevant in the context of this study's findings, where the ICT competence of teachers in Daik Lingga Regency recorded the lowest score (average 2.980, Level 3). The fact that the provincial IP-TIK shows improvement, albeit gradual, indicates that systemic efforts to increase digital capacity at the provincial level are underway. This provides hope that the structural conditions that are the main obstacles (such as connectivity and device access) will gradually be overcome.

However, it should be noted that an increase in ICT-IP does not necessarily lead to a direct increase in teachers' ICT competence. As emphasized in the 2023 Teacher Competency Model Operational Guidelines, ICT mastery is not only a matter of technical access but also adaptive ability, namely the ability of teachers to design effective learning strategies despite infrastructure limitations (Sari et al., 2024).

Qualitative Exploration (Teachers' Voices from the Field)

As part of the sequential explanatory design, further qualitative exploration was conducted through semi-structured interviews with 15 teachers from various levels in Daik Lingga Regency. Participants were selected purposively based on the criterion of having a low score on sub-indicator 1.2.5 (Adaptive Use of ICT). The interview data were analyzed using thematic analysis as described in the methodology section, which produced the following three main themes.

Theme 1: Infrastructure as the Main Barrier to Digital Innovation

"*We are enthusiastic about using educational videos or interactive platforms, but the signal here is very unstable. The only place with a relatively stable signal is the school yard, and even then only from 10 a.m. to 2 p.m. Outside of those hours, it can take up to 10 minutes to load a single page. In the end, we went back to lectures and worksheets, which we know work."* (Junior high school teacher, 42 years old).

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This quote confirms that infrastructure limitations are not abstract, but rather daily operational obstacles that force teachers to fall back on conventional methods, even though they want to innovate.

Theme 2: The Gap Between Training and Classroom Reality

"I once participated in a good ICT training program in Batam City. We were taught to use sophisticated applications, but when I returned to school, I couldn't put it into practice. It wasn't because I didn't remember how to do it, but because the applications required a large data plan and higher-spec devices. It felt like being taught to drive a sports car when all I had was a bicycle." (High school teacher, aged 38).

This statement highlights a fundamental problem in professional development programs. The training provided is often not contextual and does not take into account the resource constraints in island regions, causing frustration and rendering the training ineffective.

Theme 3: Creative Local Adaptation Strategies within Limitations

"We couldn't rely on internet connections, so I used to download educational videos from YouTube when I was in town. Then I collected them on a laptop and it became a 'video library' that I lent to other teachers. For quizzes, we used Google Forms, but printed them out and distributed them as worksheets. Even though it's not real-time, students can still practice." (Elementary school teacher, 45 years old).

This quote is clear evidence of the adaptive expertise mentioned in the discussion. It shows that even when faced with extreme limitations, teachers in Daik Lingga have developed creative and collaborative strategies to continue incorporating digital elements into their teaching, albeit in a simple and limited form.

Quotes from in-depth interviews provide confirmation and narrative depth to the quantitative findings. They validate that low ICT scores are not a reflection of laziness or resistance, but rather a logical response to an environment full of obstacles. These narratives also reveal the paradox that teachers' high motivation and creativity are hampered by unsupportive infrastructure. These findings reinforce policy recommendations to design bottom-up and contextual ICT training. Rather than simply training teachers to use sophisticated tools, training should focus on strategies for curating offline digital content, i.e., how to find, store, and distribute digital materials without internet dependency. Optimizing low-specification devices through the use of lightweight applications and basic features can still enhance learning interactions. Adaptive Blended Learning models design learning that effectively combines face-to-face interaction with limited use of ICT.

Discussion

The findings of this study indicate that the reflection of teachers' pedagogical competence in Daik Lingga Regency is generally at Level 3 (Evaluating) to Level 4 (Proficient) according to the taxonomy of the 2023 Teacher Competency Model Operational Guidelines (Dirjen, 2023). The majority of sub-indicators scored above 60 percent on average, indicating a relatively strong foundation of pedagogical competence, even though it is still categorized as "Needs Training." This picture reflects the teachers' mature reflective capacity in understanding and assessing their learning practices. However, behind these general achievements, there are significant disparities in certain sub-indicators that require more specific policy attention.

The most prominent disparity is seen in the sub-indicator of adaptive use of ICT (1.2.5), which recorded the lowest score (2.980; 59.60 percent) and is the only sub-competency at Level 3. This low achievement does not reflect the inability of teachers, but rather serves as empirical validation of the structural barriers typical of island regions. As reported by Badiozaman et al. (2024), Indonesia's island regions face limitations in internet connectivity, digital infrastructure, and high logistics costs. Under these conditions, adaptive abilities as defined in the teacher competency model are difficult to achieve without adequate systemic support.

These findings are consistent with various international studies showing that ICT integration is greatly influenced by the availability of infrastructure and institutional support. Studies in Uganda,

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Ethiopia, Latin America, and South Africa all confirm that limited access to technology, internet connectivity, and teacher training are major obstacles to the pedagogical implementation of ICT (Hunduma & Mekuria, 2023; Kibirige, 2023; Mathebula et al., 2025; Santillán et al., 2025). Systemic support, including continuous professional development and an environment that encourages experimentation, is an important prerequisite for building adaptive competencies (Serrière & Daniela, 2025; Wullschleger et al., 2023). Thus, the position of teachers in Daik Lingga is better understood as being able to evaluate the use of ICT, but not yet having the structural space to innovate collaboratively.

Conversely, the main strength of teachers is evident in the humanistic aspects of pedagogy, particularly in creating a safe and comfortable learning environment (sub-indicator 1.1.3; score 3.420). Almost all teachers are at Level 3–4 in this aspect, indicating a high capacity for building emotional and psychological relationships with students. This finding is in line with research that confirms that a sense of security at school contributes directly to student engagement and learning outcomes (Grannäs et al., 2025). However, the imbalance between humanistic and technological competencies indicates that teacher professional development is not yet fully supported by a balanced ecosystem. This confirms that pedagogical competence is greatly influenced by geographical context, infrastructure, and culture (Andal & Panergayo, 2025).

The high activation rate of *belajar.id* accounts, at 93.88 percent, shows that teachers in Daik Lingga have strong digital motivation and participation, refuting the assumption that teachers in island regions are resistant to technology. However, this administrative involvement has not yet fully transformed into mastery of adaptive competencies in learning. These findings reinforce the urgency of shifting ICT training from a generic approach to a contextual approach that is relevant to local conditions. In line with the gradual improvement of the Riau Islands Province ICT Development Index (Sari et al., 2024), policies need to be directed to ensure teachers' pedagogical readiness when infrastructure improves. From a theoretical perspective, teachers' reflective capacity is an important asset for developing adaptive expertise based on the cultural context and island environment (McGraw & Walker, 2024).

CONCLUSION

This study reveals the profile of teachers' pedagogical competence in Daik Lingga Regency, an archipelagic region with unique geographical, infrastructural, and socio-cultural challenges. Based on a quantitative analysis of Training Needs Assessment (TNA) data from 804 educators, teachers' pedagogical competencies are generally at Level 3 (evaluating) to Level 4 (proficient) according to the 2023 Teacher Competency Model. These findings indicate that teachers in remote areas have mature reflective capacities and strong professional commitment in carrying out their pedagogical roles. This strength is particularly reflected in teachers' ability to create a sense of security and comfort for students, which is an important foundation for humanistic and contextual learning.

Behind these achievements, this study also identifies disparities in certain aspects that require policy attention. The sub-indicator of adaptive ICT use shows the lowest achievement compared to other indicators, not as a reflection of weak pedagogical competence of teachers, but as empirical evidence of structural barriers inherent in the context of the archipelago. Limited internet connectivity, inadequate digital infrastructure, and high logistics costs are determining factors that influence the implementation of ICT competencies in the field. These findings challenge the uniform standard approach to teacher competency assessment and emphasize the importance of a contextual perspective in understanding the achievements and professional development needs of teachers in remote areas.

Overall, this study confirms that improving the quality of education in island regions cannot be separated from fair and adaptive systemic support. These TNA data-based findings provide an empirical basis for the formulation of more contextual teacher professional development policies, particularly through the strengthening of ICT competencies tailored to offline conditions or bandwidth limitations, without neglecting the strengths of humanistic pedagogy that teachers already possess. In addition, the development of learning achievement reporting competencies also needs to be directed so that it does not merely fulfill administrative requirements but truly functions as a reflective instrument for learning improvement. Thus, educational transformation in Daik Lingga Regency requires synergy between

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national policies, local innovation, and recognition of the reflective capacity of teachers as the main agents of change in the context of structural limitations.

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