Indonesia Journal of Learning Education and Counseling
homepage: https://journal.ilininstitute.com/index.php/IJoLEC
Vol 8, No 2, March 2026, pp 170-181
p-ISSN:2460-1497 and e-ISSN: 2477-3840

Analyzing Teachers' Needs for Digital-Based Collaborative Training Toward Quality Inclusive Education

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Article info

Article history:
Received: 12-01-2026
Revised: 20-02-2026
Accepted: 24-03-2026
Publish: 30-03-2026

Keywords:
Inclusive Education;
Teacher Collaboration;
Digital Training;
Needs Analysis;

Abstract

Inclusive education requires effective collaboration between regular teachers and special education teachers to ensure equitable learning opportunities for all students. Collaborative practices are still constrained by limited digital competence and the lack of systematic professional development programs. This study aims to analyze teachers' needs for digital-based collaborative training in inclusive education settings as a preliminary needs analysis for developing a collaborative training model. The study employed a quantitative descriptive design involving 20 teachers from inclusive schools in Makassar, consisting of 10 special education teachers and 10 regular teachers, selected using purposive sampling. Data were collected using a Likert-scale questionnaire and analyzed using descriptive statistical analysis (percentage) to identify the level and dimensions of teachers' training needs. The findings indicate that teachers demonstrate a high need for strengthening digital literacy to support collaborative practices, particularly in the use of educational technology for communication, joint lesson planning, and instructional coordination between teachers. Teachers also report a strong need to improve collaborative competencies and develop structured strategies for implementing collaborative learning in inclusive classrooms. These findings provide empirical evidence for determining teachers' professional development priorities and contribute to the development of digital-based collaborative training models that strengthen teachers' digital competence and support more effective collaborative practices in inclusive education.

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DOI: https://doi.org/10.31960/ijolec.v8i2.3337

INTRODUCTION

Inclusive education in Indonesia faces significant challenges, particularly in ensuring adequate professional support for students with disabilities (Isnawati et al., 2025). Previous studies indicate that the availability of teachers with special education competencies in inclusive schools remains limited compared to the growing number of students with special needs (Yunita & Subagya, 2025). This imbalance creates difficulties for schools in providing appropriate learning support and individualized educational services for students with disabilities (Abeykoon, 2024). Consequently, regular teachers and special education teachers are required to collaborate in planning, implementing, and evaluating inclusive learning practices to address the diverse needs of students in inclusive classrooms.

Effective collaboration between regular teachers and special education teachers is essential to provide equitable educational services for students with special needs (Alabdallat et al., 2021). Regular teachers often face limited knowledge of adaptive teaching strategies and students' specific learning needs, while special education teachers must bridge the regular curriculum with individualized support (Ii et al., 2025). Despite its importance, collaboration is not easily achieved in practice. Differences in role perceptions, lack of integrated collaborative training, and ineffective communication frequently hinder collaboration in inclusive classrooms (Cole, 2025). As a result, the potential benefits of collaboration are often not fully realized.

Teacher collaboration has been shown to significantly improve the quality of lesson planning and instructional practices in inclusive education (Yousefi et al., 2025). However, effective collaboration requires continuous professional support. Collaborative practices are still constrained by limited professional development opportunities and the absence of structured training programs that promote sustainable collaboration (Appavoo et al., 2019). Furthermore, conventional face-to-face training programs are often limited by time constraints, geographical barriers, and lack of continuity, making it difficult for teachers to engage in ongoing collaborative learning. These limitations highlight the need for more flexible and sustainable approaches to support teacher collaboration.

In this context, digital technology emerges as a logical and necessary solution to address these challenges. The rapid development of digital technology, along with the increasing demand for inclusive education, makes digital-based collaborative training not only relevant but also urgent. Digital platforms enable regular and special education teachers to communicate, collaboratively design instructional strategies, share individualized learning plans, and engage in continuous professional dialogue beyond the limitations of time and location (Johler, 2022). Through digital-based training, teachers can participate in sustained collaborative learning, access shared resources, and develop more responsive instructional practices tailored to students with diverse needs (Rapanta et al., 2020).

Although numerous studies have examined the challenges of inclusive education and emphasized the importance of teacher collaboration, most have focused on classroom practices or school-level collaboration. Limited attention has been given to how teachers' needs for digital-based collaborative training are identified and addressed. This gap is critical, as the effectiveness of any training model depends on its alignment with teachers' actual needs and contextual challenges. Without such understanding, training programs risk being fragmented and unsustainable.

Therefore, this study aims to analyze teachers' needs for digital-based collaborative training to support the implementation of inclusive education. The findings are expected to contribute to the development of more adaptive, flexible, and sustainable teacher training models that respond to the evolving demands of inclusive education in the digital era.

Inclusive education is widely understood as an approach that ensures all learners, including those with special needs, have equal opportunities to learn together in regular classrooms through accessible, participatory, and non-discriminatory practices (Florian & Black-Hawkins, 2011; Ainscow, 2020). Global frameworks such as the Salamanca

Statement and Sustainable Development Goal 4 further reinforce the importance of inclusive and equitable education systems (Unesco, 2020; Appavoo et al., 2019).

However, while these frameworks emphasize equity and participation, their implementation often reveals structural and pedagogical challenges. In many contexts, including Indonesia, the rapid increase in students with special needs is not matched by the availability of qualified special education teachers. For instance, the imbalance between more than 146,000 students with special needs and approximately 4,695 special education teachers (Arifa, 2024) reflects a significant service gap. Similar findings in other contexts (Abeykoon, 2024) suggest that inclusive education is frequently constrained by limited professional support, insufficient infrastructure, and gaps in teacher competencies.

This condition indicates that inclusive education cannot rely solely on the presence of special education teachers. Instead, it requires shared responsibility through collaboration between regular teachers and special education teachers. Previous studies consistently highlight that inclusive practices are more effective when teachers work collaboratively to design, implement, and evaluate learning (Symeonidou, 2017). Therefore, collaboration emerges not only as a supporting factor but as a central mechanism in addressing the limitations of inclusive education systems.

Collaboration between regular and special education teachers has been widely recognized as a key strategy in improving inclusive learning outcomes. Collaboration refers to structured cooperation between regular teachers and special education teachers to support the success of students with special needs in inclusive classrooms (Bastiana & Syamsuddin, 2025). Studies show that collaborative practices such as co-teaching, joint lesson planning, and shared assessment contribute to improved instructional quality and better student outcomes (Qin et al., 2025; Olore, 2017). From a theoretical perspective, collaboration is supported by the Communities of Practice framework, which emphasizes shared learning through collective engagement (Graven, 2003), and Social Interdependence Theory, which highlights the importance of mutual goals and positive interdependence (Johnson & Johnson, 2009).

Despite these benefits, empirical findings reveal that collaboration is often difficult to sustain in practice. Some studies emphasize the effectiveness of co-teaching models (Murawski & Lee Swanson, 2001), while others point out that such models require strong institutional support and continuous professional development to be effective. Differences in role expectations, lack of structured training, and limited communication are consistently identified as barriers to successful collaboration (Cole, 2025).

These contrasting findings indicate that although collaboration is theoretically strong and empirically beneficial, its implementation remains inconsistent. This suggests that the issue is not the absence of collaborative models, but the lack of sustainable systems that support teachers in developing collaborative competencies. Therefore, strengthening collaboration requires not only conceptual understanding but also continuous and structured professional development.

Digital-Based Teacher Training. Teacher training plays a crucial role in enhancing professional competence and supporting instructional innovation (Darling-Hammond et al., 2017). In the context of inclusive education, training is particularly important to equip teachers with the skills needed to address diverse learning needs. However, previous studies indicate that conventional face-to-face training often fails to provide sustained support due to limitations in time, accessibility, and continuity.

In response to these limitations, digital-based training has emerged as a promising alternative. Compared to traditional approaches, digital training offers greater flexibility, broader access, and opportunities for continuous professional engagement across geographical boundaries (Gottschalk & Weise, 2023). It also enables the use of interactive and personalized learning environments, which can enhance teacher engagement and learning outcomes (Cherbonnier et al., 2024).

Importantly, digital platforms do not only function as delivery tools but also as spaces for collaboration. Studies suggest that digital environments can facilitate ongoing

professional dialogue, resource sharing, and joint problem-solving among teachers (Voogt & Knezek, 2021). This is particularly relevant for inclusive education, where collaboration between regular and special education teachers is essential but often constrained by logistical barriers.

However, the effectiveness of digital-based training is influenced by several factors, including teachers' digital literacy, access to infrastructure, and perceptions of technology. The Technology Acceptance Model (Davis, 1989) explains that perceived usefulness and ease of use significantly affect technology adoption. This indicates that digital training initiatives must be aligned with teachers' needs and contexts to be effective.

The literature above shows that inclusive education, teacher collaboration, and digital professional development have been widely studied. However, these areas are often examined separately. Studies on inclusive education tend to focus on policy and classroom practices, while research on collaboration emphasizes co-teaching models and interaction patterns. Meanwhile, digital training studies generally focus on technology integration without specifically addressing the collaborative needs of teachers in inclusive settings.

This fragmentation highlights a critical gap. There is still limited research that integrates these three dimensions by specifically analyzing teachers' needs for digital-based collaborative training in inclusive education contexts. Without such integration, training programs risk being misaligned with real classroom challenges and may fail to support sustainable collaboration.

Therefore, this study offers a novel contribution by integrating collaborative teacher development with digital training approaches, focusing on teachers' actual needs in inclusive education. This approach represents a state-of-the-art perspective, as it moves beyond examining individual components toward developing a more holistic and context-responsive training model.

METHOD

This study employed a quantitative descriptive research design with a survey approach to analyze teachers' needs for digital-based collaborative training in inclusive schools. The study was conducted in several inclusive schools in Makassar, Indonesia. The participants consisted of 20 teachers, including 10 special education teachers and 10 regular teachers who were directly involved in inclusive education practices. The respondents were selected using purposive sampling to ensure that all participants had experience teaching students with special needs in inclusive classrooms. Most participants had less than five years of teaching experience, and all held a bachelor's degree in education.

The research instrument was a Likert-scale questionnaire (1–5) consisting of 25 closed-ended statements measuring several indicators of training needs, including academic discussions, preparation of Individualized Education Programs (IEPs), digital literacy, the use of Learning Management Systems (LMS), and team coordination. In addition, three open-ended questions were included to explore teachers' perspectives on the ideal form of training as well as the challenges associated with both online and offline training formats. Prior to data collection, the instrument underwent content validity assessment through expert judgment. Two experts in inclusive education and educational technology were involved in evaluating the relevance, clarity, and representativeness of each item in relation to the research constructs. Based on their feedback, several items were revised to improve clarity and alignment with the indicators being measured. This process ensured that the questionnaire had adequate content validity before being distributed to respondents. Furthermore, the questionnaire was tested for reliability using Cronbach's Alpha. The reliability analysis showed that the instrument had good internal consistency, with a Cronbach's Alpha coefficient of $\alpha = 0.89$, indicating that the questionnaire items were reliable for measuring teachers' training needs.

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RESULTS AND DISCUSSION

1. Sociodemographics of Respondents

Of the 20 respondents, table 1 below provides detailed sociodemographic overview.

Table 1 Teacher Sociodemographics

Characteristics	Frequency (n)	Percentage
Gender		
Female	14	70%
Male	6	30%
Position		
Special Education Teacher	10	50%
Regular Teacher	10	50%
Teaching Experience		
< or = 5 years	12	60%
> 5 years	8	40%
Final Education		
Bachelor's Degree	20	100%

Based on Table 1, the majority of respondents were women (70%), while 30% were men**.** In terms of teaching roles, the respondents were evenly distributed between special education teachers and regular teachers**,** with each group consisting of 10 teachers (50%)**.** This balanced distribution allows the study to capture perspectives from both teacher groups involved in implementing inclusive education.

Regarding teaching experience, most respondents (60%) had less than five years of teaching experience, while the remaining 40% had five or more years of experience. This distribution indicates that many participants are still in the early stages of their teaching careers, which may influence their professional development needs, particularly in areas related to inclusive teaching practices and the use of digital learning technologies.

In terms of educational background, all respondents (100%) held a bachelor's degree in education. This indicates that the participants meet the minimum academic qualification required for teaching in schools. However, despite having similar academic qualifications, teachers may still require additional professional development, particularly in collaborative practices, preparation of Individualized Education Programs (IEPs), and the use of digital platforms for inclusive learning.

Overall, these sociodemographic characteristics suggest the importance of providing structured professional training programs that support both regular teachers and special education teachers in improving their competencies in inclusive and technology-supported learning environments.

2. Analyzing Teacher Needs

Based on the results of the average score, further analysis can be made regarding the priority of teacher needs. Digital literacy and technology use ranked highest, indicating a skills gap in utilizing online platforms. Guidance in the preparation of IEP and awareness of the importance of collaborative training is also high, showing the need for continuous academic assistance. The ability to work with other teachers, even though it is good, still needs strengthening.

To clarify the proportion of these needs, pie charts can be used to show the relative percentage of each aspect of teacher needs based on average scores.

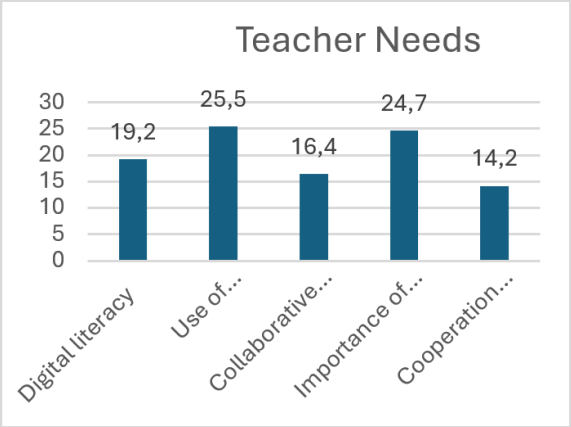

Figure 1. Proportion of teachers' needs in digital-based collaborative training

Based on Figure 1, the distribution of teachers' needs in digital-based collaborative training shows several priority areas. The highest proportion of needs is related to the use of technology for collaboration (25.5%), indicating that teachers require greater support in utilizing digital tools and platforms to facilitate collaborative work in inclusive classrooms. This may include the use of learning management systems, shared digital documents, and other online communication tools that enable effective coordination between teachers.

The second highest proportion is the importance of collaborative training (24.7%), suggesting that teachers perceive structured collaborative professional development programs as essential for improving their instructional practices. This finding indicates that teachers not only need technological skills but also systematic training that strengthens teamwork and shared responsibility in inclusive education settings.

The need for digital literacy (19.2%) appears at a moderate level. This result suggests that although teachers already possess basic digital skills, further development is still necessary to ensure that technology can be effectively integrated into collaborative teaching practices and inclusive learning environments. In addition, the need for guidance in designing collaborative learning (16.4%) reflects teachers' demand for pedagogical support in planning and implementing collaborative instructional strategies. Such support is particularly important in inclusive classrooms where teachers must coordinate instructional plans and adapt learning activities to accommodate diverse student needs.

The lowest proportion is found in cooperation with other teachers (14.2%). This result may indicate that basic forms of collaboration among teachers already exist in schools; however, these collaborative practices may not yet be fully supported by structured training or technology integration.

Overall, the results highlight that teachers' professional development priorities focus on strengthening technology-supported collaboration, indicating the importance of designing professional training programs that integrate digital competence and collaborative teaching practices in inclusive education.

Discussion

1. Sociodemographics of Respondents

The findings indicate that the majority of respondents were women (70%), which is consistent with the broader trend of the teaching profession in primary education in Indonesia, where female teachers are more prevalent (Bentri et al., 2022). In terms of professional roles, the distribution between Special Education Teachers and Regular Teachers was balanced (50% each), suggesting that both groups are equally represented in inclusive education settings and share similar responsibilities in supporting students with special needs.

Furthermore, most respondents had relatively short teaching experience, with 60% having five years or less. This indicates that a significant proportion of participants were early-career teachers. The involvement of these novice teachers highlights the importance of providing professional development programs that are flexible, accessible, and responsive to their needs, particularly in the context of digital-based training.

This finding is supported by Darling-Hammond et al. (2017), who emphasize that novice teachers require continuous professional support to develop their competencies and adapt to the demands of 21st-century education. In this context, digital-based training becomes particularly relevant, as it offers opportunities for ongoing learning and collaboration that align with the

characteristics and needs of early-career teachers.

2. Analyzing Teacher Needs

Analyzing teacher needs is an important step because it provides an initial idea of the priorities that need to be considered in designing training. This is also in line with the view of Borg & Gall who emphasized the importance of needs analysis in development research (Borg & Gall, 1983), that well-identified needs will increase the relevance and effectiveness of the program. Thus, the prediction of needs not only serves as a mapping, but also as a strategic basis for anticipating implementation challenges and maximizing the benefits of training for teachers in inclusive schools.

The results show that the highest proportions of teachers' needs are related to the use of technology for collaboration (25.5%) and the importance of collaborative training (24.7%). This indicates that teachers require greater support in integrating digital technologies to facilitate collaboration and instructional planning. These findings reflect the increasing demands of 21st-century learning**,** where technology integration and collaborative practices are essential competencies for teachers. However, many teachers still face challenges in effectively applying digital tools in their teaching practices. Similar findings are reported by the OECD, which notes that teachers in many countries experience difficulties integrating technology into instruction (Gottschalk & Weise, 2023). In addition, continuous professional development is necessary to help teachers adapt to technological changes (Darling-Hammond et al., 2017).

Therefore, these results highlight the importance of developing structured digital training programs that support teachers in strengthening both technological and collaborative competencies in inclusive education.

These findings are which affirms the importance of 21st century competencies, including digital literacy, for teachers, and is reinforced by Schleicher who emphasizes that digital skills are the foundation to support modern teaching practices (Schleicher, 2018). In addition, research by Fraillon et al. also shows that teachers' digital literacy contributes significantly to the quality of inclusive learning in the digital era (Fraillon, 2024). UNESCO research also highlights that teachers who are less skilled in technology are at risk of falling behind in providing inclusive and adaptive educational services *(UNESCO Digital Library*, 2025). The transformation of global education requires mastery of digital literacy as a core competency of teachers. Digital literacy not only helps teachers access learning resources, but also strengthens their ability to design innovative learning (Voogt & Knezek, 2021). In addition, Fraillon et al. show that teachers' digital competence has a direct effect on student engagement and learning effectiveness (Fraillon, 2024). This strengthens the urgency of teachers' need to obtain systematic digital-based training.

The use of technology without a clear pedagogical strategy can unintentionally widen existing learning gaps. Educational technology must therefore be grounded in an inclusive pedagogical vision to prevent the emergence of new inequalities, particularly for students with special educational needs (UNESCO, 2021). Digital transformation in education will only be meaningful and sustainable when accompanied by the development of teachers' pedagogical capacity to integrate technology effectively, rather than merely mastering its technical aspects.

Finally, opinion supports the results of this study by emphasizing that digitally trained teachers will be better prepared to face the challenges of 21st century learning . However, this readiness must still be accompanied by adequate policy support, resources, and learning communities. This view is also reinforced by Darling-Hammond et al. who emphasize the importance of continuous professional development so that teachers are able to adapt to technological changes (Darling-Hammond et al., 2017). Fraillon et al., also show that teachers' digital literacy contributes directly to the effectiveness of inclusive learning (Fraillon, 2024). As such, Schleicher's opinion is in line with various studies that emphasize the urgency of comprehensive and continuous digital training for teachers.

However, there are also views that reject or criticize these findings. Not all teachers feel the immediate benefits of using technology, especially when infrastructure support and technical readiness are still limited (Wang & Torrisi-Steele, 2021). This

means that although the need for digital literacy is high, practical challenges on the ground can hinder implementation. The biggest obstacle to technology adoption comes from teachers' beliefs and attitudes, not just technical limitations (Ertmer & Ottenbreit-Leftwich, 2010). Without the support of school policies and a supportive organizational culture, technology integration will not run optimally (Tondeur et al., 2017). In addition, good technology skills help teachers reduce the learning gap in heterogeneous classrooms, thus further reinforcing the urgency of digital training (Fraillon, 2024;Fraillon et al., 2020).

The findings of this study indicate that teachers' digital literacy needs are at a moderate level, while the need for using technology to support collaboration is relatively higher. This pattern is consistent with findings from studies conducted in various countries, which show that teachers generally possess basic digital skills but still face challenges in integrating technology into pedagogical and collaborative practices. For instance, Voogt and Knezek (2021) found that teachers' digital competence tends to be stronger in operational aspects than in the use of technology for meaningful learning and professional collaboration.

In relation to teacher professional development, these findings are also consistent with the view that effective training should not only focus on improving individual competencies but also on strengthening collaborative practices (Darling-Hammond et al., 2017). However, many professional development programs still emphasize individual skill development, thus providing limited support for collaborative practices such as co-teaching, joint lesson planning, and collective problem-solving. This may explain why, in this study, the need for technology-supported collaboration is higher than the need for basic digital literacy.

Furthermore, these findings do not appear to be unique but rather reflect a broader global trend in the post-pandemic context. The rapid integration of digital technologies in education has increased teachers' familiarity with digital tools; however, this has not been accompanied by a corresponding development in collaborative digital practices (Gottschalk & Weise, 2023). This suggests that the gap identified in this study is also observed in international contexts and is not limited to the local setting.

In the context of inclusive education, the higher need for technology-supported collaboration can also be explained by the complexity of coordination between regular teachers and special education teachers. Activities such as co-planning, developing Individualized Education Programs (IEPs), and maintaining continuous communication require sustained interaction, which can be more effectively facilitated through digital platforms.In relation to teacher professional development, these findings are also consistent with the view that effective training should not only focus on improving individual competencies but also on strengthening collaborative practices (Darling-Hammond et al., 2017). However, many professional development programs still emphasize individual skill development, thus providing limited support for collaborative practices such as co-teaching, joint lesson planning, and collective problem-solving. This may explain why, in this study, the need for technology-supported collaboration is higher than the need for basic digital literacy.

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This study has several limitations that need to be acknowledged. First, the sample size was relatively small, which limits the generalizability of the findings. Second, the study was conducted within a limited

geographic context, focusing only on teachers in Makassar. Therefore, the results may not fully represent the conditions in other regions with different educational contexts.

Given these limitations, the findings of this study should be interpreted as exploratory or preliminary. Future research is recommended to involve a larger and more diverse sample to enhance the generalizability of the results. Additionally, further studies could explore the effectiveness of digital-based collaborative training through experimental or longitudinal designs.

CONCLUSION AND SUGGESTION

This study aimed to identify teachers' needs for digital-based collaborative training in inclusive schools. The findings indicate that the highest training needs are related to the use of technology for collaboration (25.5%) and the importance of collaborative training (24.7%), highlighting the need for professional development programs that integrate digital tools with collaborative teaching practices. In addition, teachers expressed a need for strengthening digital literacy and guidance in designing collaborative learning, particularly in preparing practical instructional products such as lesson plans and Individualized Education Programs (IEPs).

The findings of this study have several implications for teacher professional development. First, training programs should integrate digital competence and collaborative learning approaches, enabling teachers to effectively use technology for communication, planning, and instructional collaboration. Second, professional development should adopt product-based training models, where teachers actively develop instructional materials such as lesson plans and IEPs during training activities. Third, training providers should consider flexible and blended training formats that combine online and offline learning to overcome infrastructure and scheduling challenges.

This study has several limitations. First, the research involved a relatively small sample size (20 teachers) from inclusive schools in one city, which may limit the generalizability of the findings. Second, the study relied primarily on self-reported survey data, which may not fully capture teachers' actual classroom practices.

Future research could involve larger and more diverse samples from different regions to obtain a broader understanding of teachers' training needs. In addition, further studies could develop and test specific models of digital-based collaborative training to evaluate their effectiveness in improving teachers' competencies in inclusive education settings.

CRediT authorship contribution statement

Bastiana: Conceptualization, Investigation, Formal analysis, writing original draft, Project administration. **Syamsuddin**: Methodology, Validation, Supervision, Writing review and editing. **Maenuddin Bustanil Syah**: Data curation, Resources, Visualization, Investigation, Writing review & editing. **Reza Hadiwijaya Dynasti**: Data curation, Software, Visualization, Writing review & editing.

Declaration of competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

Declaration of the use of AI

During the preparation of this work the authors used Grammarly for proof reading and spell checking. The authors reviewed and edited the content as necessary and took full responsibility for the content of the publication. Content as needed and take full responsibility for the content of the publication.

Acknowledgments

This work was supported by the Directorate General of Higher Education, Research, and Technology, Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia under the Fundamental Research Scheme (2025)

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