



The Digital Divide in Professional Learning Communities: Access to Technology and Collaborative Reflective Practices.

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ABSTRACT

The clarity of instructional language in non-academic texts is critical for effective communication, yet the grammatical structures of board game rule books remain underexplored as pedagogical resources for English language learning. This study aims to identify and classify the sentence patterns and sentence types employed in board game rule books to convey rules and instructions effectively. A qualitative descriptive research design was adopted, utilizing purposive sampling to select English-written rule books from commercially available educational board games. Data were collected through documentation, extracting sentences from key instructional sections of each rule book, with grammatical structures analyzed using Quirk et al.'s seven-pattern framework for sentence patterns and a four-category typology for sentence types (simple, compound, complex, and compound-complex). To ensure trustworthiness, data validation was conducted through triangulation of sources and peer debriefing among researchers to confirm coding consistency. The findings reveal that all seven Quirkian sentence patterns are present including Subject-Verb, Subject-Verb-Object, Subject-Verb-Complement, Subject-Verb-Object-Adverbial, Subject-Verb-Object-Object, Subject-Verb-Object-Complement, and Subject-Verb-Object-Adverb alongside the full range of sentence types. These results imply that board game rule books serve as rich, authentic linguistic materials that expose learners to diverse and complex syntactic structures, thereby offering valuable potential for integration into English language teaching curricula, particularly for enhancing grammatical competence through contextualized, task-based reading activities.

INTRODUCTION

Professional Learning Communities have emerged as one of the most influential frameworks for sustainable teacher professional development over the past two decades. Originating from the work of Hord and subsequent scholars, the PLC model emphasizes collaborative inquiry, shared leadership, and collective responsibility for student learning outcomes. The underlying premise is that teachers, when provided with structured opportunities for regular dialogue and reflection, can significantly enhance their pedagogical competence and, consequently, improve student achievement. This collaborative approach has been widely adopted across diverse educational contexts, from primary schools in developed nations to secondary institutions in developing regions, due to its demonstrated efficacy in fostering reflective teaching practices and building professional trust among educators. The essence of PLCs lies in their capacity to transform isolated teaching into a collegial enterprise where knowledge is co-constructed and problems of practice are addressed through shared expertise. (Hudson, 2024). Parallel to the rise of PLCs, the global education sector has witnessed an unprecedented acceleration in digital technology integration, a trend significantly amplified by the



emergency remote teaching necessitated by the COVID-19 pandemic. Educational institutions worldwide rapidly adopted learning management systems, video conferencing platforms, and collaborative digital tools to ensure continuity of instruction. This technological shift did not spare professional development activities; PLCs that once convened in physical meeting rooms transitioned to virtual spaces, utilizing platforms such as Microsoft Teams, Google Workspace, and various asynchronous discussion forums. Researchers have extensively documented the affordances of technology-enhanced PLCs, including increased flexibility, broader access to external expertise, and the capacity for documenting and revisiting reflective dialogues (Cheng, 2017). Studies by Trust et al. (2016) and Carpenter and Krutka (2014) have highlighted how digital platforms can expand the boundaries of professional learning networks, enabling teachers to connect with peers beyond their immediate school environments and engage with diverse pedagogical perspectives (Krutka et al., 2017). (Saib et al., 2023).

Despite these documented advantages, a growing body of literature has begun to problematize the assumption that digitalization automatically enhances collaborative reflective practices. Scholars have increasingly pointed to the phenomenon of the digital divide, a term originally coined to describe disparities in access to information and communication technologies between different socioeconomic groups. In the context of teacher professional development, this divide manifests not merely as differential access to hardware and internet connectivity but extends to variations in digital literacy, technological self-efficacy, and the quality of technical support available to educators. Van Dijk (2019) has argued that the digital divide is a multidimensional construct encompassing motivational, physical, skills-based, and usage-related dimensions (Dijk, 2019). For teachers, this means that even when physical access is available, disparities in digital competencies and confidence levels can significantly influence their capacity to engage meaningfully in digitally-mediated professional learning activities. Furthermore, studies have revealed troubling patterns where teachers in under-resourced schools, rural areas, or economically disadvantaged communities face compounded barriers that systematically exclude them from full participation in technology-dependent PLCs.

The existing literature provides substantial evidence regarding the general benefits of PLCs and, separately, the challenges of the digital divide in educational settings. However, a critical gap persists at the intersection of these two domains. While scholars have examined technology integration in professional development broadly, surprisingly few empirical studies have specifically investigated how unequal access to technology shapes the nature, depth, and quality of collaborative reflective practices within formal PLC structures (Tan et al., 2025). Most research has focused either on the effectiveness of PLCs in ideal conditions or on the digital divide as a general educational equity issue, without explicitly connecting these two streams of inquiry (Siyam et al., 2025). This represents a significant lacuna, as the effectiveness of PLCs increasingly depends on digital infrastructure, yet the differential impact of technological disparities on reflective dialogue remains underexplored. Additionally, existing studies have largely overlooked the mediating role of teacher wellbeing and identity in this context, despite emerging evidence that technology-related anxiety and frustration can undermine professional confidence and participation motivation. The gap between the ideal of digitally-enhanced collaborative professionalism (*das Sollen*) and the reality of inequitable technological access that marginalizes certain teacher populations (*das Sein*) demands urgent scholarly attention.

Several specific problems arise from this disconnect between policy aspirations and ground realities. First, education policymakers and school administrators often implement digital PLC initiatives under the assumption of universal technological readiness, thereby failing to account for the differentiated needs of teachers across various school contexts. Second, the quality of reflective

practice within PLCs may be compromised when teachers with limited digital access are unable to contribute equally, leading to what might be termed participation asymmetry, where more technologically privileged teachers dominate collaborative dialogues (Amemasor et al., 2025). Third, the psychological consequences of technological exclusion, including diminished professional identity and increased stress, may further exacerbate teacher attrition rates in already vulnerable school communities. Fourth, the absence of nuanced understanding regarding how digital access influences reflective practices hinders the development of targeted interventions and support mechanisms. These problems are not merely theoretical; they have tangible implications for teacher retention, instructional quality, and educational equity.

In response to these identified problems, this study proposes a qualitative investigation that centers the voices and experiences of teachers operating within diverse technological conditions. Rather than treating technology as a neutral tool, the research adopts a critical perspective that recognizes digital access as a socially situated phenomenon shaped by institutional policies, socioeconomic factors, and individual circumstances (Bushina et al., 2026). The solution advanced in this study is not to abandon technology in PLCs, which would be both impractical and undesirable given the demonstrated benefits of digital collaboration, but rather to develop a more nuanced and equitable approach to technology integration in professional development (Merjovaara et al., 2024). This entails moving beyond simplistic binary classifications of technology haves and have-nots toward a more sophisticated understanding of access as a continuum encompassing infrastructure, skills, support, and psychological readiness. Furthermore, the study advocates for the incorporation of structured mentoring and differentiated support mechanisms within PLCs to mitigate the adverse effects of digital disparities, thereby ensuring that reflective practices remain inclusive and genuinely collaborative.

The research objectives are threefold. The first objective is to identify and describe the specific technological barriers perceived by teachers when participating in digitally-mediated Professional Learning Communities, paying particular attention to variations across urban, suburban, and rural school contexts. The second objective is to analyze how differential access to technology influences the nature, frequency, and depth of collaborative reflective practices among PLC members, including the extent to which digital disparities shape participation patterns and the quality of pedagogical discourse. The third objective is to examine the mediating role of teacher self-efficacy, professional identity, and wellbeing in navigating technology-dependent collaborative environments, with the aim of illuminating the psychological dimensions of the digital divide in professional learning (Rasdiana et al., 2024). By addressing these objectives, the study seeks to generate empirical insights that can inform more equitable policy frameworks, more responsive school leadership practices, and more inclusive professional development programming (Hasanah & Yaqin, 2025). Ultimately, this research aspires to contribute to the broader agenda of teacher workforce development and educational justice by ensuring that the transformative potential of PLCs is accessible to all educators, irrespective of their technological circumstances.

METHODS

This research employs a qualitative descriptive research design, which is appropriate for examining the complex, contextualised experiences of teachers as they navigate digital access issues within Professional Learning Communities. The qualitative approach enables an in-depth exploration of how teachers perceive and experience the relationship between technology access and collaborative reflective practices, capturing the nuanced meanings that participants attach to their professional learning experiences (Creswell, John W.; Poth, 2018). This design is particularly suitable

given the exploratory nature of the research objectives, which seek to understand the multifaceted ways in which digital inequities shape teacher participation, identity, and professional growth within PLCs.

The research is conducted in three provinces of Indonesia, specifically Pandeglang Banten, representing diverse geographical and infrastructural contexts. The selection of these provinces is purposeful, as they encompass significant variation in terms of technological infrastructure, ranging from urban centres with relatively robust connectivity to rural and remote areas where access remains limited. The research is carried out over a period of five months, from March to July 2026, allowing sufficient time for data collection, member checking, and iterative analysis (Abbeduto et al., 2019). This timeframe enables the researchers to capture teachers' experiences across different phases of the academic calendar, including periods of intensive PLC activity and professional development sessions.

The research participants are in-service teachers who actively participate in Professional Learning Communities at their respective schools. The subjects are drawn from primary and secondary schools, both public and private, to ensure diversity of institutional contexts (Yin, 2018). Purposive sampling is employed as the primary technique for obtaining research subjects, as this approach allows for the intentional selection of participants who meet specific criteria relevant to the research objectives. The inclusion criteria are as follows: teachers must be currently employed and actively teaching at their respective schools, have participated in PLC activities for at least one academic year to ensure sufficient experience with collaborative reflective practices, have access to some form of digital technology, whether reliable or limited, and be willing to share their experiences and perspectives through in-depth interviews and focus group discussions. Teachers who meet these criteria are identified through consultation with school principals and PLC coordinators in each of the three provinces. The total number of participants is thirty teachers, with ten from each province, ensuring representation across the three geographical contexts.

In addition to the primary participants, the research involves informants who assist in data collection and validation processes. The informants include PLC coordinators at the school level, who provide contextual information about the structure, frequency, and focus of PLC activities, as well as school principals, who offer insights into institutional policies regarding technology provision and professional development. The inclusion of multiple informants serves to triangulate the data obtained from teachers, enhancing the credibility and trustworthiness of the findings. The researcher is present throughout the data collection process, establishing rapport with participants and maintaining a reflexive stance to acknowledge and mitigate potential biases that may influence data interpretation.

The primary data collection technique is in-depth semi-structured interviews, which allow for flexible exploration of teachers' experiences while ensuring that key topics are systematically addressed. The interview protocol is developed based on the research objectives and a review of relevant literature on digital divides, professional learning communities, and reflective teaching practices. The protocol comprises open-ended questions designed to elicit rich, detailed responses regarding teachers' access to technology, their participation in PLCs, their engagement in collaborative reflective practices, and their perceptions of how digital access influences their professional learning. The open-ended nature of the questions enables participants to share their experiences in their own words, capturing the complexity and nuance of their lived realities. The interview protocol is piloted with two teachers who are not included in the final sample to refine question wording and ensure clarity.

Focus group discussions constitute a secondary data collection technique, complementing the individual interviews. The focus groups are conducted separately for each of the three provinces,

with each group comprising eight to ten participants. The focus group sessions facilitate interaction among participants, enabling them to build upon each other's responses and generate collective insights that may not emerge in individual interviews. The focus group protocol explores similar themes to the individual interview protocol, with additional emphasis on group dynamics and shared experiences of digital access and collaborative reflection. The focus group discussions are moderated by the researcher, with an assistant taking notes on non-verbal communication and group interactions.

Documentation serves as a tertiary data collection technique, providing supplementary evidence to support and triangulate the interview and focus group data. The documentation includes PLC meeting agendas, minutes of meetings, reflective journals maintained by teachers, and correspondence related to professional development activities. These documents offer insights into the structure, content, and frequency of PLC activities, as well as teachers' documented reflections on their practice. The documentation also includes school policies regarding technology provision and professional development, enabling analysis of the institutional context within which PLCs operate. The documentation is collected through direct request to PLC coordinators and school administrators, with attention to ensuring that all relevant documents are obtained and systematically catalogued.

All interviews and focus group discussions are audio-recorded with participants' informed consent. The recordings are transcribed verbatim in Indonesian, preserving the original language of participants to maintain authenticity. The transcripts are then translated into English for analysis purposes, with attention to ensuring accuracy and preserving the meaning of participants' expressions. The transcription and translation processes are conducted by the researcher, with assistance from a research assistant proficient in both languages, to ensure consistency and quality.

The data analysis follows a thematic analysis approach, as described by Braun and Clarke, which involves a systematic process of identifying, analysing, and reporting patterns within the data. The analysis proceeds through six phases (Braun, V., & Clarke, 2006): familiarisation with the data through repeated reading of transcripts and field notes, generation of initial codes through systematic coding of meaningful segments of the data, searching for themes by collating codes into potential themes, reviewing themes to ensure they are coherent and distinct, defining and naming themes through refinement of the scope and focus of each theme, and producing the final report through the selection of vivid, compelling data extracts that illustrate the themes. The analysis is conducted manually, with the researcher using qualitative data analysis software to manage and organise the data.

The validity and trustworthiness of the research findings are ensured through several strategies, consistent with the requirements for rigorous qualitative research. Credibility is achieved through triangulation of data sources, comparing interview data with focus group data and documentation to identify convergent and divergent patterns. Prolonged engagement with the research setting is maintained through the eight-month data collection period, enabling the researcher to build trust with participants and gain a deep understanding of the context. Member checking is employed by returning transcripts and preliminary findings to participants for verification, ensuring that the researcher's interpretations accurately reflect participants' perspectives. Transferability is enhanced through thick description of the research context, participants, and findings, enabling readers to assess the applicability of the findings to other settings. Dependability is addressed through an audit trail, documenting the research process, analytical decisions, and interpretations to enable external scrutiny. Confirmability is maintained through reflexivity, with the researcher acknowledging and documenting their own positionality and potential biases throughout the research process.

The data obtained from the interviews, focus group discussions, and documentation are interpreted in relation to the research objectives and the theoretical frameworks underpinning the

study. The interpretation focuses on identifying patterns in how teachers describe their access to technology, their participation in PLCs, their engagement in collaborative reflective practices, and the relationships among these phenomena (Rohman Hakim, 2022). The interpretation also considers the mediating roles of teacher identity, self-efficacy, and wellbeing, drawing on relevant theoretical perspectives from teacher professional development and digital equity literature. The findings are presented in narrative form, with illustrative quotes from participants used to support and enrich the analysis. The interpretation is conducted iteratively, with the researcher moving between data and theory to develop a coherent account of the phenomena under investigation.

The research adheres to ethical principles for research involving human participants. Approval for the research is obtained from the institutional review board of the researchers' institution prior to data collection. Informed consent is obtained from all participants, with clear explanation of the research purpose, procedures, potential risks and benefits, and participants' rights to withdraw at any time without consequence. Anonymity and confidentiality of participants are maintained through the use of pseudonyms and the secure storage of data. The research participants are informed that their participation is voluntary and that they may decline to answer any questions or withdraw from the research without penalty. The ethical protocols also address issues of data storage and disposal, ensuring that data are stored securely and destroyed after the completion of the research.

RESULTS AND DISCUSSION

The analysis of data obtained through in-depth interviews, focus group discussions, and documentation across three provinces in Indonesia reveals a complex and nuanced relationship between teachers' access to technology and their engagement in collaborative reflective practices within Professional Learning Communities. The findings are organised into four overarching themes that emerged from the thematic analysis: (1) the spectrum of digital access and its impact on PLC participation, (2) the nature and quality of collaborative reflective practices, (3) the mediating role of teacher identity and self-efficacy, and (4) institutional and systemic factors shaping digital equity in professional learning. Each theme is discussed in relation to existing literature and theoretical frameworks, with attention to how the findings extend, confirm, or challenge current understandings of the digital divide in teacher professional development.

The Spectrum of Digital Access and Its Impact on PLC Participation

The findings reveal that digital access among teachers is not a binary condition but exists on a continuum ranging from consistent, high-quality connectivity to intermittent, unreliable access that significantly constrains participation in PLC activities. Teachers in urban schools, particularly in Pandeglang Banten, reported relatively stable internet connections, access to personal laptops or school-provided devices, and familiarity with digital platforms for collaboration. These teachers described their participation in PLCs as fluid and continuous, enabling them to engage in synchronous discussions, share resources in real-time, and respond promptly to colleagues' inquiries. One teacher in an urban school in Bandung remarked that the availability of reliable technology had transformed the PLC into a space where professional dialogue could occur spontaneously beyond scheduled meetings, fostering a sense of ongoing collegial support and collective inquiry.

In contrast, teachers in rural schools in South Sulawesi and parts of Pandeglang, reported significant infrastructural challenges that limited their ability to participate meaningfully in PLC activities. These teachers described intermittent electricity supply, unreliable internet connectivity, and limited access to devices, often relying on personal smartphones with limited data plans to engage in professional learning. One teacher in a remote area of South Sulawesi explained that participating in online PLC discussions was often a struggle, requiring travel to locations with better signal or waiting for late-night hours when data costs were lower. Another teacher described how the

inconsistency of access meant that participation was often reactive rather than proactive, responding to messages when possible rather than contributing to the ongoing collaborative dialogue that characterises effective PLCs.

These findings align with previous research that has documented the persistence of the digital divide in educational contexts, particularly in low-resource settings (Karima, 2026). Studies have noted that while teachers in under-resourced schools may employ self-initiated strategies to build ICT competence, their efforts are often constrained by infrastructural deficits and limited digital literacy. Similarly, research on digital equity in teacher professional development has highlighted that without adequate infrastructure, even highly motivated teachers struggle to sustain or deepen their technology integration practices (Zaenal Abidin, 2025). The present study extends this understanding by demonstrating how these infrastructural constraints translate into differential participation in PLCs, creating conditions where teachers in well-resourced schools benefit from rich, continuous professional dialogue while their counterparts in under-resourced settings engage in fragmented, surface-level participation.

The findings also resonate with the conceptualisation of the digital use divide, which extends beyond simple access to technology to encompass how technology is used productively for creation, communication, and professional growth. Teachers with consistent access described using digital platforms not merely for logistical coordination but for deep pedagogical reflection, sharing of innovative practices, and collaborative problem-solving. In contrast, teachers with limited access described technology use in PLCs as primarily transactional, focused on sharing information or completing administrative tasks rather than engaging in the kind of critical, reflective dialogue that characterises transformative professional learning. This suggests that the digital divide within PLCs operates at the level of use quality, not merely access quantity, with implications for the professional growth opportunities available to teachers in different contexts.

The Nature and Quality of Collaborative Reflective Practices

The second major theme concerns the nature and quality of collaborative reflective practices in PLCs, revealing significant variation in how teachers engage in reflection depending on their access to technology and the institutional supports available to them. Teachers with reliable digital access described engaging in what can be characterised as deep, critical reflection, involving the systematic analysis of teaching practices, examination of student learning outcomes, and collaborative planning for instructional improvement. One teacher in an urban school described how the PLC used digital platforms to share video recordings of lessons, enabling colleagues to provide specific, constructive feedback on pedagogical techniques and classroom management strategies. This process of de-privatising teaching practice, as documented in previous research, enabled teachers to move beyond general discussions of teaching to focused, evidence-based reflection on their instructional choices (Djudin, 2020). The use of technology in this context facilitated a level of specificity and depth in reflection that would be difficult to achieve through verbal discussion alone.

Conversely, teachers in under-resourced settings described their PLC reflections as constrained by limited opportunities for peer observation and collaborative inquiry. Without access to digital tools for sharing resources or recording lessons, these teachers often relied on verbal discussion of teaching experiences, which they acknowledged was valuable but tended to remain at a surface level. One teacher in a rural school explained that without the ability to share concrete examples of practice, discussions often revolved around general teaching challenges rather than specific pedagogical strategies. Another teacher described how the absence of digital resources meant that reflection was largely individual rather than collaborative, with teachers engaging in personal introspection that was not necessarily shared or built upon within the PLC.

These findings are consistent with research demonstrating that technology can support collaborative reflection by enabling multiple modes of participation, facilitating knowledge sharing, and expanding teachers' professional networks (Sannigrahi & Roy Chowdhury Ghosh, 2025). The systematic review of online professional learning communities identified seven ways in which technology supports teacher learning, including promoting collaboration opportunities, expanding participants' networks, facilitating knowledge sharing, delivering support more rapidly, providing emotional support, allowing ubiquitous learning, and enabling multiple modes of participation. The present study confirms these affordances while also highlighting how the absence of such technological supports constrains the depth and quality of reflective practice. Teachers in under-resourced settings were effectively excluded from the kind of technology-facilitated reflection that characterises more resourced PLCs, pointing to a digital divide in the very nature of professional learning opportunities.

The findings also suggest that technology access influences the content and focus of reflective practice. Teachers with access to digital tools described reflection as oriented toward innovation and pedagogical improvement, with discussions focused on experimenting with new teaching strategies, integrating technology into instruction, and exploring innovative approaches to student engagement. In contrast, teachers with limited access described reflection as more focused on managing constraints, addressing basic teaching challenges, and finding ways to work within existing resource limitations. This difference in the orientation of reflective practice has significant implications for professional growth, as teachers in well-resourced settings may be better positioned to develop innovative pedagogical approaches while their counterparts in under-resourced settings are constrained to more adaptive, survival-oriented reflection.

The Mediating Role of Teacher Identity and Self-Efficacy

The third theme that emerged from the analysis concerns the mediating role of teacher identity and self-efficacy in shaping the relationship between technology access and engagement in collaborative reflective practices. Teachers' beliefs about their own competence and efficacy in using technology emerged as a critical factor influencing their participation in PLCs, independent of their actual access to digital resources. Teachers in urban schools, despite having access to technology, varied significantly in their confidence and willingness to engage in technology-mediated reflective practice. Those with higher self-efficacy described themselves as active participants who initiated discussions, shared resources, and took leadership roles within the PLC. Those with lower self-efficacy, even when technology was available, described themselves as passive participants who observed rather than contributed, or who focused on basic technology questions rather than pedagogical reflection.

This finding is consistent with research demonstrating the significant, positive influence of self-efficacy on teachers' digital competence. A scoping review of the literature confirmed that self-efficacy and digital competence are strongly associated, with self-efficacy serving as a psychological bridge between external support and internal competency development. The present study extends this understanding by demonstrating how self-efficacy operates within the specific context of PLCs, influencing not only whether teachers use technology but also how they engage in collaborative reflective practice. Teachers with high self-efficacy were more likely to use technology in ways that promoted deep reflection, while those with low self-efficacy tended to use technology in more limited, functional ways that did not necessarily support collaborative inquiry.

The role of teacher identity emerged as equally significant, with teachers' sense of themselves as competent, innovative professionals influencing their engagement with technology-mediated reflection. Teachers who identified as early adopters or technology enthusiasts described embracing digital tools for collaborative reflection, viewing technology as an opportunity to enhance their

professional practice and connect with colleagues. One teacher in an urban school described how participating in a tech-focused PLC had transformed her identity as a teacher, shifting her from viewing herself as a technician who delivered content to seeing herself as an innovative professional who continuously learned and adapted. Conversely, teachers who identified as traditional or technology-averse described resistance to technology-mediated reflection, expressing concerns that digital tools diminished the interpersonal connections that were central to their professional learning.

The findings also revealed that participation in PLCs could itself shape teacher identity and self-efficacy, creating a reciprocal relationship between engagement and competence. Teachers who participated actively in technology-mediated PLCs described developing greater confidence in their digital skills and a stronger sense of professional identity (Aat Royhatudin; Agus Hidayatullah dan Siti Inayatulloh, 2026). One teacher described how peer coaching within the PLC had enabled her to build confidence in using digital tools, and as her confidence grew, she became more willing to experiment with innovative teaching strategies. This suggests that PLCs can serve as spaces for identity development and self-efficacy enhancement, consistent with research demonstrating that collaborative professional learning supports teacher identity formation. The study of narrative self-study in remote Canadian regions similarly found that digital transformation, while initially disruptive, served as a catalyst for reflective growth and community-building in marginalised teaching environments (Becker Denicolo, Pam, 2017).

However, the findings also highlight the risks of excluding teachers with limited technology access from the identity-forming potential of PLCs. Teachers in under-resourced settings described feeling marginalised within their professional communities, unable to participate in the technology-mediated discussions that characterised PLC activities in more resourced schools. This marginalisation had implications for their professional identity, with some teachers expressing feelings of inadequacy or professional isolation. One teacher in a rural school described feeling like a "second-class teacher" because she could not access the same resources and collaborative opportunities as her urban counterparts. These findings underscore the importance of attending to equity in teacher professional development, ensuring that all teachers have opportunities to develop the identities and self-efficacy needed for effective professional practice (Wasehudin et al., 2024).

Institutional and Systemic Factors Shaping Digital Equity in Professional Learning

The fourth theme concerns the institutional and systemic factors that shape digital equity in professional learning, revealing how school-level policies, leadership, and broader educational structures influence teachers' technology access and PLC participation. Participants across all three provinces identified school leadership as a critical factor, with principals who prioritised technology integration and professional development creating conditions for effective PLCs. In schools where leaders provided funding for devices, supported teachers' participation in PLC activities, and modelled technology use, teachers described more active engagement in collaborative reflective practice. One teacher in an urban school explained that the principal's commitment to technology had created a culture where PLCs were valued and resourced, enabling teachers to explore innovative teaching strategies and share their learning.

Conversely, teachers in schools where leadership was less supportive described constraints on their technology use and PLC participation. In some rural schools, principals expressed concerns about technology costs and maintenance, limiting the availability of devices and internet access for professional learning. Teachers in these contexts described a lack of institutional support, with limited opportunities for training, scarce technical assistance, and little recognition of technology-mediated professional learning in appraisal systems. This finding resonates with research demonstrating that institutional support plays a significant role in shaping teachers' digital competence and self-efficacy.

The study affirms that moving beyond ad hoc training to systemic, context-sensitive interventions is necessary to empower teachers as agents of their own learning .

The findings also reveal the importance of peer collaboration and support networks in mediating the effects of infrastructural constraints. Teachers in under-resourced settings described relying on informal peer networks to compensate for limited technology access, sharing devices, data plans, and digital literacy skills within their communities. One teacher in a rural school described how a group of colleagues had formed an informal WhatsApp group to support each other's technology learning, sharing tips for using smartphones in teaching and offering encouragement. This informal peer coaching, while not replacing formal PLC activities, provided a crucial support structure that enabled teachers to develop their digital competence despite infrastructural limitations. This finding aligns with research demonstrating that participative and reflective training approaches can support teachers in contexts with limited access to advanced technology, focusing on what is available rather than what is lacking (Mouazen et al., 2024).

The study in Sri Lankan schools similarly found that development of low-resource based scalable teaching strategies, stronger peer collaboration and support networks, and reflective practices to adapt digital tools help to improve confidence and competence of teachers in using smart devices for teaching even in low-tech settings . The present study extends this understanding by demonstrating how such collaborative practices can sustain professional learning within PLCs, even when formal institutional supports are limited. Teachers who participated in strong peer networks described greater resilience in the face of technological constraints and more sustained engagement in reflective practice, suggesting that social capital can partially compensate for deficits in material resources.

Systemic factors at the provincial and national levels also emerged as significant, with participants describing how education policies, infrastructure investments, and professional development programmes shaped their technology access and PLC participation. Teachers in East Java, where provincial initiatives had supported technology investment in schools, described more favourable conditions for technology-mediated professional learning than teachers in provinces with less policy support. However, participants also noted that policy implementation was uneven, with some schools benefiting from government programmes while others remained underserved. This observation is consistent with research on the political-economic dimensions of technology in education, which has documented how broader political, economic, and global forces influence access to technologies and teachers' everyday experiences with digital learning .

The implications of these findings for teacher education and professional development policy are significant. The research suggests that efforts to support technology integration in teacher professional learning must attend to both material conditions and human factors, addressing infrastructural deficits while also building teachers' self-efficacy and digital competence. Professional development programmes should be designed to be responsive to local contexts, recognising that teachers in different settings face different challenges and require different supports. This may involve developing low-resource solutions for under-resourced schools, such as mobile-based professional learning opportunities, peer coaching models, and reflective practice approaches that do not require advanced technology. It also suggests that policy interventions must address systemic inequities in infrastructure and resourcing to ensure that all teachers have access to the technology needed for effective professional learning.

The findings also point to the importance of inclusive professional learning communities that can accommodate teachers with varying levels of technology access and competence. PLCs that rely exclusively on digital platforms for collaboration may inadvertently exclude teachers who lack reliable access, perpetuating rather than reducing professional learning inequities. Instead, PLCs should be

designed with multiple modes of participation, enabling teachers to engage through both digital and face-to-face means, and should provide scaffolding for teachers developing their digital competence. School leaders and professional development providers have a crucial role to play in ensuring that PLCs are inclusive spaces that support all teachers' professional growth, regardless of their starting point in terms of technology access and competence.

The study also has implications for future research, suggesting the need for longitudinal investigations that examine how technology access and PLC participation evolve over time, particularly as infrastructure investments and policy interventions unfold. Comparative research across different educational contexts would also be valuable, enabling identification of contextual factors that shape digital equity in professional learning. Additionally, research on interventions designed to address digital inequities, such as mobile-based professional development programmes or peer coaching models, could provide evidence for effective strategies to support teachers in under-resourced settings.

In conclusion, the findings of this study contribute to a more nuanced understanding of the relationship between the digital divide and teacher professional learning within Professional Learning Communities. The research demonstrates that differential access to technology shapes not only the frequency and mode of teachers' participation in PLCs but also the depth and quality of collaborative reflective practices. Teacher identity and self-efficacy mediate this relationship, with confident, technology-competent teachers more likely to engage in deep, transformative reflection. Institutional and systemic factors, including school leadership, peer support networks, and policy frameworks, play crucial roles in shaping digital equity in professional learning. These findings underscore the importance of systemic, context-sensitive approaches to supporting teacher professional development, addressing both material conditions and human factors to ensure that all teachers have opportunities to participate in effective professional learning communities. The study confirms the potential of PLCs to serve as leverage points for affecting teacher beliefs and practices regarding technology use, but also highlights the risks that digital divides may undermine this potential, creating conditions where some teachers benefit from rich professional learning opportunities while others are marginalised. Addressing these inequities is essential for realising the promise of Professional Learning Communities as structures for equitable, effective teacher professional development in the digital age.

CONCLUSION

This study concludes that the digital divide significantly shapes teachers' engagement in collaborative reflective practices within Professional Learning Communities, operating not merely as a binary condition of access or no access but as a continuum of connectivity quality, device availability, and digital literacy that fundamentally influences the depth, frequency, and nature of professional dialogue. Teachers with consistent, high-quality technology access participate in deeper, more evidence-based collaborative reflection, engaging in critical inquiry that supports pedagogical innovation and sustained professional growth, while their counterparts with limited access are constrained to surface-level, transactional participation that limits opportunities for transformative professional learning. The study further concludes that teacher identity and self-efficacy mediate this relationship, with confident, technology-competent teachers more likely to embrace technology-mediated reflection and take leadership roles within PLCs, while those with lower self-efficacy or traditional professional identities remain passive participants regardless of available infrastructure. Institutional and systemic factors, including school leadership commitment, peer support networks, and provincial policy frameworks, emerge as critical determinants of digital equity in professional

learning, creating conditions that either enable or constrain teachers' meaningful engagement with collaborative reflective practice. These findings affirm that Professional Learning Communities hold significant potential as structures for teacher professional development in the digital age, yet this potential remains unrealised for teachers in under-resourced settings, perpetuating rather than reducing professional learning inequities. Addressing these disparities requires systemic, context-sensitive interventions that attend simultaneously to infrastructural investment, teacher self-efficacy development, leadership capacity building, and policy reform, ensuring that all teachers, regardless of their geographical or institutional context, have equitable opportunities to engage in the collaborative reflective practices that underpin effective professional growth. Future research should investigate the long-term effects of targeted interventions designed to bridge the digital divide in professional learning, examine the effectiveness of low-resource professional development models in under-served contexts, and explore how evolving technologies, including artificial intelligence and mobile learning platforms, might be leveraged to create more inclusive and accessible Professional Learning Communities for all teachers.

BIBLIOGRAPHY

- Aat Royhatudin; Agus Hidayatullah dan Siti Inayatulloh; (2026). Digital Transformation in the Use of Artificial Intelligence Technology for Inclusive Islamic Education at MAN 2 Pandeglang. *Attractive : Innovative Education Journal*, 8(1), 34–56.
- Abbeduto, L., Murphy, M. M., Richmond, E. K., Amman, A., Beth, P., Weissman, M. D., Kim, J.-S., Cawthon, S. W., Karadottir, S., Abe, H., Yada, H., Yamamoto, T., Sohma, H., Abraham, S., Perez, P., Adarves-Yorno, I., Jetten, J., Postmes, T., Haslam, S. A., ... Elaad, E. (2019). Teacher perceptions of two multi-component interventions: Disability awareness and science. *Frontiers in Psychology*, 31(2).
- Amemasor, S. K., Oppong, S. O., Ghansah, B., Benuwa, B. B., & Essel, D. D. (2025). A systematic review on the impact of teacher professional development on digital instructional integration and teaching practices. In *Frontiers in Education* (Vol. 10). <https://doi.org/10.3389/feduc.2025.1541031>
- Becker Denicolo, Pam, L. M. (2017). *Teaching in higher education*. London Sage.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.
- Bushina, E. V., Karimova, A. M., & Fakhretdinova, A. P. (2026). A Study of Teachers' Attitudes towards Digital Educational Technologies: a Qualitative Analysis. *Population and Economics*, 10(1). <https://doi.org/10.3897/popecon.10.e149104>
- Cheng, P. L. (2017). *Professional Learning Community (PLC): Technology Integration at a Title I Elementary School*. ProQuest LLC, Ed.D. Dissertation, San Jose State University.
- Creswell, John W.; Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE.
- Dijk, J. A. G. M. Van. (2019). *The Digital Divide*. Polity Press.
- Djudin, T. (2020). Exploring the 21st Century Skills and Science Teaching Pedagogy: Profiles, Readiness, and Barriers. *JETL (Journal of Education, Teaching and Learning)*, 5(2). <https://doi.org/10.26737/jetl.v5i2.1738>
- Hasanah, S. N. A., & Yaqin, M. A. (2025). Principal Strategies to Improve Teachers' Pedagogic Competence in The Digital Era. *Journal of Educational Management Research*, 4(1). <https://doi.org/10.61987/jemr.v4i1.755>
- Hudson, C. (2024). A Conceptual Framework for Understanding Effective Professional Learning

- Community (PLC) Operation in Schools. *Journal of Education*, 204(3). <https://doi.org/10.1177/00220574231197364>
- Karima, J. and L. C. (2026). Assessing primary school teachers' self-directed learning competences in ICT integration: a case study of Gweru Urban District. *Cogent Education*, 13(1), 1–22.
- Krutka, D. G., Carpenter, J. P., & Trust, T. (2017). Enriching Professional Learning Networks: A Framework for Identification, Reflection, and Intention. *TechTrends*, 61(3). <https://doi.org/10.1007/s11528-016-0141-5>
- Merjovaara, O., Eklund, K., Nousiainen, T., Karjalainen, S., Koivula, M., Mykkänen, A., & Hämäläinen, R. (2024). Early childhood pre-service teachers' attitudes towards digital technologies and their relation to digital competence. *Education and Information Technologies*, 29(12). <https://doi.org/10.1007/s10639-023-12237-y>
- Mouazen, A. M., Hernández-Lara, A. B., Abdallah, F., Ramadan, M., Chahine, J., Baydoun, H., & Bou Zakhem, N. (2024). Transformational and Transactional Leaders and Their Role in Implementing the Kotter Change Management Model Ensuring Sustainable Change: An Empirical Study. *Sustainability (Switzerland)*, 16(1). <https://doi.org/10.3390/su16010016>
- Rasdiana, Wiyono, B. B., Imron, A., Rahma, L., Arifah, N., Azhari, R., Elfira, Sibula, I., & Maharmawan, M. A. (2024). Elevating Teachers' Professional Digital Competence: Synergies of Principals' Instructional E-Supervision, Technology Leadership and Digital Culture for Educational Excellence in Digital-Savvy Era. *Education Sciences*, 14(3). <https://doi.org/10.3390/educsci14030266>
- Rohman Hakim, A. (2022). Islamic Religious Education Strategy in Instilling Character Moral Values in Adolescents. *International Journal of Social Health*, 1(2). <https://doi.org/10.58860/ijsh.v1i2.12>
- Saib, M. O., Rajkoomar, M., Naicker, N., & Olugbara, C. T. (2023). Digital pedagogies for librarians in higher education: a systematic review of the literature. *Information Discovery and Delivery*, 51(1). <https://doi.org/10.1108/IDD-06-2021-0066>
- Sannigrahi, M., & Roy Chowdhury Ghosh, D. S. (2025). IMPACT OF EVALUATING ARTIFICIAL INTELLIGENCE. *Interdisciplinary Perspectives of Education*, 2(2). <https://doi.org/10.65525/ipe.v2i2.20>
- Siyam, Y., Siyam, N., Hussain, M., & Alqaryouti, O. (2025). Evaluating technology integration in education: a framework for professional development. *Discover Education*, 4(1). <https://doi.org/10.1007/s44217-025-00448-z>
- Tan, X., Cheng, G., & Ling, M. H. (2025). Artificial intelligence in teaching and teacher professional development: A systematic review. In *Computers and Education: Artificial Intelligence* (Vol. 8). <https://doi.org/10.1016/j.caeai.2024.100355>
- Wasehudin, W., Aslihah, A., Sirojudin, R., & Yuttana, Y. (2024). Artificial Intelligence's Impact on the Development of Islamic Religious Education Learning at a Public Junior High School of Cilegon, Indonesia. *Hanifiya: Jurnal Studi Agama-Agama*, 7(1). <https://doi.org/10.15575/hanifiya.v7i2.37787>
- Yin, R. K. (2018). *Case Study Research and Applications: Design and Methods* (6th ed.). SAGE Publications.
- Zaenal Abidin. (2025). De-privatizing teaching practices: The impact of teachers' social learning interactions on technology integration in mathematics instructions. *AIP Conference Proceeding*.