

Teachers' Perceived Barriers to Digital Instructional Media Integration: A Descriptive Qualitative Study in a Rural Elementary School

Hambatan Integrasi Media Pembelajaran Digital dari Perspektif Guru: Studi Kualitatif Deskriptif pada Sekolah Dasar Pedesaan

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ABSTRACT

This study aimed to explore teachers' perceptions of the limited use of digital instructional media at SD Negeri Sungayang and to identify the factors shaping these practices. A descriptive qualitative approach was employed, involving four purposively selected teachers. Data were collected through semi-structured in-depth interviews and analyzed through repeated reading, coding, category development, and theme construction based on the interactive analytical model of Miles, Huberman, and Saldaña. The analysis generated three interrelated themes: limited digital technology operational skills, difficulties in developing and adapting instructional media, and perceived time demands associated with preparing and using media. The findings suggest that limited technological fluency may increase difficulties in media development and perceived time cost, which, for some teachers, contributed to a preference for more familiar teaching methods requiring minimal preparation. These findings can be interpreted through the TPACK framework, particularly as constraints related to *Technological Knowledge* and *Technological Pedagogical Knowledge*, rather than as a comprehensive diagnosis of teachers' TPACK competence. Practically, the findings suggest the potential value of peer mentoring and ready-to-use digital instructional resources, although these strategies require further implementation and evaluation. Given that the study involved only four teachers from a single school, the findings are intended to provide contextual insight rather than broad generalization.

Key words : Digital Instructional Media; Teacher Perceptions; TPACK; Technological Skills; Perceived Time Cost; Rural Elementary School

ABSTRAK

Penelitian ini bertujuan mengeksplorasi persepsi guru mengenai keterbatasan penggunaan media pembelajaran digital di SD Negeri Sungayang serta mengidentifikasi faktor-faktor yang membentuk praktik tersebut. Penelitian menggunakan pendekatan kualitatif deskriptif dengan melibatkan empat guru yang dipilih secara purposif. Data dikumpulkan melalui wawancara mendalam semi-terstruktur dan dianalisis melalui pembacaan berulang, pengodean, pengelompokan kategori, serta pengembangan tema berdasarkan model analisis interaktif Miles, Huberman, dan Saldaña. Hasil penelitian menghasilkan tiga tema yang saling berkaitan, yaitu keterbatasan kemampuan operasional teknologi digital, kesulitan mengembangkan dan menyesuaikan media pembelajaran, serta persepsi terhadap tingginya kebutuhan waktu dalam menyiapkan dan menggunakan media. Temuan menunjukkan bahwa keterbatasan kelancaran teknologi dapat meningkatkan kesulitan pengembangan media dan perceived time cost, yang pada sebagian guru mendorong preferensi terhadap metode pembelajaran yang lebih familiar dan membutuhkan persiapan minimal. Temuan ini dapat diinterpretasikan melalui kerangka TPACK, khususnya sebagai kendala yang berkaitan dengan Technological Knowledge dan Technological Pedagogical Knowledge, tanpa dimaksudkan sebagai diagnosis menyeluruh terhadap kompetensi TPACK guru. Secara praktis, temuan menunjukkan potensi manfaat peer mentoring dan sumber media digital siap pakai, tetapi strategi tersebut masih memerlukan implementasi dan evaluasi lebih lanjut. Karena penelitian hanya melibatkan empat guru pada satu sekolah, temuan memberikan wawasan kontekstual, bukan generalisasi terhadap seluruh sekolah dasar pedesaan.

Kata Kunci : *Media Pembelajaran Digital; Persepsi Guru; TPACK; Kemampuan Teknologi; Beban Waktu; Sekolah Dasar Pedesaan*

INTRODUCTION

Digital transformation in education has expanded the ways in which teachers design, deliver, and facilitate learning in elementary schools. In this context, digital instructional media encompass technology-based devices and resources, such as computers, projectors, videos, digital presentations, and interactive applications used to support content delivery and learning activities. The use of such media can make instructional content more concrete, visual, and interactive; however, its successful implementation largely depends on teachers' readiness to integrate technology with pedagogical needs and subject-matter characteristics. Hasanah et al. (2023), for example, highlighted the importance of teachers' perceptions regarding the need for instructional multimedia in elementary education, while Indahyanti and Rahman (2022) showed that teachers' acceptance of instructional media does not necessarily correspond to the frequency of its actual classroom use. Therefore, the central issue extends beyond the availability of technology to encompass how teachers understand, select, and integrate digital media into their everyday instructional practices.

A growing body of research on teachers' perceptions of technology and instructional media has generally reported relatively positive attitudes. Kournikova et al. (2025) reported that 74.1% of elementary school teachers in their study expressed positive perceptions of ICT integration, although some respondents continued to experience implementation barriers.

Similar findings regarding teachers' perceptions and perceived needs have been reported by Hasanah et al. (2023), Indahyanti and Rahman (2022), and Mutmainnah and Khaerunnisa (2024). Collectively, these studies suggest that teachers generally recognize the potential benefits of technology and instructional media. Nevertheless, positive attitudes alone do not adequately explain why technologies perceived as beneficial are not consistently integrated into actual classroom practice. This gap between technological acceptance and actual implementation is particularly important because teachers' decisions to use digital media are shaped by their competencies, available time, curriculum content, facilities, and institutional support.

A second stream of research has focused more specifically on barriers to the use of digital instructional media. Winda and Dafit (2021) identified limited facilities, age-related factors, inadequate technological competence, and insufficient infrastructure as major constraints. Similarly, Nisak and Rofi'ah (2023) identified teachers' limited ability to operate digital media as a major implementation problem, while Falah et al. (2023) reported difficulties among prospective elementary and Madrasah Ibtidaiyah teachers in developing digital instructional media. Other studies have emphasized the importance of digital learning strategies and infrastructural support in expanding the use of instructional media (Husna, 2024; Khinanti et al., 2025). Taken together, these studies indicate that barriers to technology integration are multidimensional, encompassing not only access to devices but also teachers' competencies, media-design skills, pedagogical readiness, and time constraints. However, much of the existing literature primarily identifies categories of barriers or teachers' perceptions, while offering less detailed insight into how these constraints interact in teachers' day-to-day decisions to use or avoid digital instructional media.

To explain the relationship among technological competence, pedagogy, and instructional content, this study adopts *Technological Pedagogical Content Knowledge* (TPACK) as its primary conceptual framework. TPACK proposes that meaningful technology integration requires the interaction of *Technological Knowledge* (TK), *Pedagogical Knowledge* (PK), and *Content Knowledge* (CK), together with the forms of knowledge that emerge from their intersections (Mishra & Koehler, 2006; Phillips et al., 2025). Within this framework, the ability to operate a computer or projector represents only one dimension of TK. Teachers also require *Technological Pedagogical Knowledge* (TPK), which concerns understanding how technology can be effectively incorporated into pedagogical strategies, and *Technological Content Knowledge* (TCK), which concerns aligning technological tools with the characteristics of subject matter. Accordingly, teachers' difficulties in developing media appropriate to instructional content, operating digital devices, or perceiving media use as excessively time-consuming should not be interpreted merely as deficiencies in technical

skills; rather, they may reflect broader challenges in integrating technological and pedagogical knowledge.

A focused synthesis of the literature reviewed in this study reveals at least four major research streams. First, studies of teachers' perceptions generally demonstrate positive acceptance of educational technology (Kournikova et al., 2025; Indahyanti & Rahman, 2022; Mutmainnah & Khaerunnisa, 2024). Second, research on barriers to digital media use identifies technological competence, age, facilities, infrastructure, and media-development skills as recurring challenges (Winda & Dafit, 2021; Nisak & Rofi'ah, 2023; Falah et al., 2023). Third, studies on digital media development and technology-based learning strategies suggest that appropriate media design and technological support can enhance learning experiences, although such studies tend to focus more heavily on the media or intervention itself than on teachers' experiences of implementation (Hasanah et al., 2023; Husna, 2024). Fourth, the TPACK literature provides a conceptual explanation of the interaction among TK, PK, CK, and their intersections, but further contextual interpretation is needed to understand how these dimensions operate within teachers' routine instructional decisions (Mishra & Koehler, 2006; Phillips et al., 2025). Based on this synthesis, the research gap addressed in the present study is not framed as an absence of research in rural schools; rather, it concerns the limited qualitative understanding of how elementary school teachers in a particular rural context interpret the interrelationships among digital competence, pedagogical capability, content adaptation, and time constraints in their use of digital instructional media.

SD Negeri Sungayang provides a relevant setting in which to explore these issues in greater depth. In the present study, the school is positioned as a rural elementary-school context. Accordingly, the study does not seek to generalize its findings to all rural schools but instead aims to generate a contextualized understanding of teachers' experiences in integrating digital instructional media. This perspective is important because barriers to technology use cannot always be understood solely in terms of device availability. Teachers' experiences in preparing instructional media, operating technological devices, aligning media with instructional content, and managing limited classroom time may generate distinct implementation challenges across school contexts. A qualitative approach is therefore appropriate for examining these experiences and considerations in greater depth than would be possible through measures of technology-use frequency or attitudinal scales alone.

Based on the identified gap, the novelty of this study lies in using the TPACK framework to qualitatively understand teachers' experiences of limited digital instructional media integration within a rural elementary-school context, with particular attention to the interrelationships among technological competence, media-design capability, pedagogical appropriateness, and instructional time management. This contribution does not rest on the claim that rural educational contexts have never been studied; rather, it lies in providing a

contextual explanation of how these constraints interact in teachers' everyday practices. Such a perspective shifts attention away from viewing limited access to technological devices as the sole problem and toward a more integrated understanding of teachers' professional knowledge and the practical conditions under which instruction occurs.

Accordingly, this study aims to explore teachers' perceptions of the limited use of digital instructional media at SD Negeri Sungayang, identify the factors shaping these practices, and interpret their implications through the TPACK framework.

METHOD

This study employed a descriptive qualitative approach to explore teachers' perceptions of the limited use of digital instructional media in teaching practices at SD Negeri Sungayang. A descriptive qualitative design was selected because it enables researchers to produce accounts that remain close to participants' experiences, language, and perspectives regarding the phenomenon under investigation (Sandelowski, 2000). Four teachers were selected through purposive sampling based on the following criteria: (1) being an active teacher at SD Negeri Sungayang; (2) having at least two years of teaching experience; (3) having either direct or limited experience in using digital instructional media; and (4) being willing to describe their experiences, perceived benefits, barriers, and needs related to digital media use. Purposive sampling was considered appropriate because participants were selected on the basis of their direct and relevant experience with the phenomenon under study (Palinkas et al., 2015). The adequacy of four participants was justified using the principle of information power, which suggests that fewer participants may be sufficient when the research aim is narrowly focused, the participant group is relatively homogeneous, and participants possess highly relevant experience (Malterud et al., 2016). Accordingly, the sample size was intended to achieve contextual depth rather than statistical representation. To protect confidentiality, participants were anonymized using the codes P1–P4.

Data were collected through individual, face-to-face, semi-structured in-depth interviews conducted in a quiet and private setting within SD Negeri Sungayang between 4 November and 15 December 2025. Each interview lasted approximately 30–45 minutes and was conducted in Indonesian, while participants were allowed to use local expressions when necessary to communicate their experiences more naturally. The interview guide consisted of eight core questions addressing participants' experiences with digital instructional media, types of digital media commonly used, their ability to operate computers, laptops, and projectors, difficulties in developing digital media, challenges in aligning media with instructional content, time constraints during preparation and classroom implementation, support from the school or colleagues, and professional development needs. Follow-up and *probing questions* were used according to each participant's responses to obtain richer and

more detailed information. With participants' consent, the interviews were audio-recorded, transcribed verbatim, and subsequently checked against the recordings to ensure accuracy. Brief follow-up clarification was conducted when statements were ambiguous or required further explanation, although full repeat interviews were not conducted once the information obtained was considered sufficient. Transparent reporting of interviewer characteristics, interview procedures, recording, and transcription was guided by the Consolidated Criteria for Reporting Qualitative Research (COREQ) (Tong et al., 2007).

Data analysis was informed by the interactive model of Miles, Huberman, and Saldaña (2014) and involved repeated reading of the transcripts, identification of meaningful units, generation of initial codes, comparison of codes across participants, grouping of related codes into categories, and subsequent development and review of themes. This process generated three overarching themes: (1) limited teachers' digital capabilities, (2) limited competence in developing and adapting instructional media, and (3) perceived time demands associated with preparing and using instructional media. As part of the audit trail, for example, the statement "I cannot connect the laptop to the projector" was coded as difficulty operating digital equipment, grouped under the category technological operational constraints, and subsequently incorporated into the theme digital capability barriers. Credibility was strengthened by comparing patterns across P1–P4 and clarifying unclear information with participants. Dependability and confirmability were supported through documentation of coding decisions, category development, theme construction, and researcher reflexive notes (Lincoln & Guba, 1985; Nowell et al., 2017). The researcher was affiliated with the field of education and had no structural, supervisory, or evaluative relationship with the participants. A consistent interview guide, reflexive notes, and cross-participant comparison were used to reduce the potential influence of researcher bias (Berger, 2015). Permission to conduct the study was obtained from the principal of SD Negeri Sungayang. Participation was voluntary, informed consent was obtained before the interviews, participants were informed of their right to decline questions or withdraw from the study, separate permission was obtained for audio recording, and all identities and research data were kept confidential in accordance with established principles of qualitative research ethics and reporting quality (Tong et al., 2007; Tracy, 2010).

RESULTS AND DISCUSSION

1. Results

Analysis of the interviews with four teachers generated three overarching themes explaining the limited use of digital instructional media at SD Negeri Sungayang: (1) limited digital technology operational skills, (2) limited competence in developing and adapting

instructional media, and (3) perceived time demands associated with preparing and using instructional media. These themes did not emerge as entirely independent barriers. Rather, the data indicate an interaction among teachers' ability to operate technology, their ability to design media appropriate to instructional content, and their perceptions of instructional time efficiency. To ensure consistency and anonymity, all participants are referred to as P1, P2, P3, and P4. The participant quotations below are presented in English translation while preserving their original meaning.

a. Limited Digital Technology Operational Skills

The first theme indicates that several participants experienced difficulties in operating digital devices directly used for classroom instruction, particularly computers, laptops, and projectors. Given that the evidence primarily concerns technical and operational abilities, the theme is more appropriately labelled limited digital technology operational skills rather than "low digital literacy." Digital literacy is a broader construct that may also encompass information evaluation, digital communication, content creation, digital safety, and problem solving, none of which were comprehensively examined in the present study.

P3 described difficulties using both computers and projectors:

"...I am not proficient in using a computer, and I also cannot use the projector..." (P3, 14 November 2025).

A similar experience was reported by P4, who described a more specific technical difficulty:

"...I cannot use the projector... I cannot connect the laptop to the projector." (P4, 15 December 2025).

These accounts suggest that, for some participants, barriers to digital media use emerged at a basic operational level. The difficulties occurred not only when teachers attempted to create instructional media but also when they attempted to operate the necessary equipment. In some cases, these limitations resulted in dependence on colleagues. P3, for instance, reported requesting assistance from another teacher when digital instructional media were needed.

Importantly, these findings should not be interpreted as evidence that age itself causes technological difficulties. A more defensible interpretation is that some participants associated their difficulties with limited previous exposure to digital technologies and long-established reliance on manual teaching practices. Thus, the pattern observed in the data concerns differences in technological experience rather than a generalized assumption that senior teachers necessarily possess lower digital competence.

b. Limited Competence in Developing and Adapting Instructional Media

The second theme concerns teachers' difficulties in developing, selecting, and aligning instructional media with lesson content. This challenge extends beyond simply operating

technological devices. Several participants recognized the potential value of instructional media but perceived the processes of creating and adapting such media to curriculum content as complex and demanding.

P1 explained:

“Sometimes I am reluctant to make the media because it is very complicated, and it is difficult to align it with the material because the material contains so many words, so I find it difficult to develop the media.” (P1, 4 November 2025).

P2 connected media-development difficulties with content density and practical classroom considerations:

“...the material is extensive and quite dense... if I use media, it takes longer and consumes time... it is also difficult to make the media, so I just use the lecture method.” (P2, 5 November 2025).

P3 further demonstrated that difficulties in developing digital media were intertwined with technological capability:

“...I have difficulty creating digital media because I am not proficient with technology, so when I need digital media, I ask another teacher to help create it.” (P3, 14 November 2025).

P4 likewise reported difficulty producing digital instructional materials, including interactive video-based media. Across participants, the findings suggest two interrelated forms of difficulty: technical difficulties in producing digital media and pedagogical difficulties in aligning media with dense or complex instructional content. For some teachers, these constraints contributed to a preference for lecture-based instruction because it was perceived as simpler and more immediately applicable without requiring an extended media-development process.

c. Perceived Time Demands Associated with Preparing and Using Instructional Media

The third theme indicates that several participants perceived instructional media use as carrying a substantial **time cost**, both before and during classroom instruction. Time-related barriers were not limited to the process of creating media; they also included transporting and preparing equipment, connecting laptops to projectors, displaying instructional materials, and ensuring that students understood the content presented through the media.

P1 stated:

“...bringing the projector and preparing everything takes time. A lesson period is only 35 minutes, and that does not yet include the preparation...” (P1, 4 November 2025).

P2 explained the relationship between limited lesson time and instructional choices more explicitly:

“...if I use media, it takes a long time and consumes a lot of the lesson time... one lesson period is only 35 minutes... so I just use the lecture method.” (P2, 5 November 2025).

P3 similarly linked preparation time with limited technological capability:

“...when I use digital media, it takes a great deal of time to prepare because I am not very proficient in using technology.” (P3, 14 November 2025).

Comparison across P1–P3 indicates that time-related barriers had two dimensions. The first was technical preparation time, including preparing equipment and instructional media. The second was instructional time, referring to teachers’ concern that using media would reduce the limited 35-minute period available for delivering lesson content. In this context, some participants selected lecture-based instruction not necessarily because they rejected digital technology, but because they perceived it as a more practical option under restricted instructional time. The data also demonstrate an interaction among the three themes: greater difficulty operating technology or developing media tended to increase the amount of preparation time teachers perceived as necessary.

Table 1. Thematic Matrix of the Findings

Theme	Subtheme/Indicator	Participants	Key Evidence
Limited digital technology operational skills	Operating computers/laptops	P3, P4	Difficulty operating digital devices independently
	Operating/connecting projectors	P3, P4	Inability to use a projector or connect a laptop to it
	Dependence on peer assistance	P1/P3	Assistance from colleagues required for digital media use or development
Limited competence in developing and adapting instructional media	Developing digital media	P1, P3, P4	Media development perceived as difficult or could not be completed independently
	Aligning media with lesson content	P1, P2	Difficulty adapting media to dense instructional content
	Preference for more practical methods	P2	Lecture-based instruction selected because it was perceived as simpler

Theme	Subtheme/Indicator	Participants	Key Evidence
Perceived time demands	Media/equipment preparation	P1, P2, P3	Media preparation perceived as time-consuming
	Limited instructional time	P1, P2	A 35-minute lesson period perceived as constraining media use
	Interaction between technological skill and time	P3	Limited technological proficiency increased preparation time

Source: Primary Data

Table 2. Analytical Audit Trail

Raw Data	Initial Code	Category	Theme
"I cannot connect the laptop to the projector."	Difficulty operating digital equipment	Technological operational constraints	Limited digital technology operational skills
"It is difficult to align the media with the subject matter."	Difficulty aligning media with content	Media-design and content-alignment constraints	Limited competence in developing and adapting instructional media
"Using media takes a long time."	Perceived time burden	Instructional time constraints	Perceived time demands
"I ask another teacher to help create it."	Dependence on peer assistance	Limited independent media development	Limited competence in developing instructional media
"One lesson period is only 35 minutes."	Restricted instructional time	Classroom time constraint	Perceived time demands

Source: Primary Data

2. Discussion

The findings indicate that the limited use of digital instructional media at SD Negeri Sungayang cannot be explained by a single factor. The three themes identified in the study limited digital technology operational skills, difficulties in developing and adapting instructional media, and perceived time demands form an interconnected pattern. These findings extend the understanding of technology integration by showing that teachers' decisions to use or avoid digital media are shaped not only by technical competence but also by pedagogical considerations and perceptions of time efficiency. Accordingly, limited digital media integration

in this context is more appropriately understood as an interaction among technological fluency, media-design demands, and perceived time cost, rather than simply as a deficit in teachers' "digital literacy."

From a theoretical perspective, these findings can be interpreted through the *Technological Pedagogical Content Knowledge* (TPACK) framework originally formulated by Mishra and Koehler (2006). TPACK conceptualizes *Technological Knowledge* (TK), *Pedagogical Knowledge* (PK), and *Content Knowledge* (CK), together with the intersections among these domains, as essential components of meaningful technology integration in teaching. In the present study, difficulties in operating computers, laptops, and projectors may be interpreted as constraints primarily related to TK, whereas difficulties in selecting, developing, and using media efficiently in classroom instruction may reflect constraints associated with TPK. Challenges in aligning instructional media with subject matter may also relate to the interaction between technology and content knowledge. However, because this study did not formally assess all TPACK domains, the findings should not be used to diagnose participants as having a general "TPACK gap." Rather, TPACK is employed here as an interpretive lens, not as a diagnostic framework. This interpretation is consistent with contemporary understandings of TPACK as a contextual and interactive framework for teacher knowledge (Mishra & Koehler, 2006; Phillips et al., 2025).

The theme of limited digital technology operational skills is also consistent with previous research. Nisak and Rofi'ah (2023) identified difficulty operating digital instructional media as an important challenge among teachers, while Falah et al. (2023) reported similar difficulties among prospective MI/elementary school teachers in developing digital media. Indahyanti and Rahman (2022) and Mutmainnah and Khaerunnisa (2024) further suggest that positive perceptions of technology do not necessarily translate into consistent classroom use. This distinction is particularly relevant to the present study because the participants did not demonstrate outright rejection of digital technology; rather, several teachers acknowledged the potential benefits of instructional media while simultaneously reporting practical difficulties in operating and implementing them. Such findings are consistent with Ertmer et al. (2012), who argued that technology integration practices are influenced not only by access to technology but also by teachers' knowledge, beliefs, previous experiences, and practical classroom conditions. Thus, the present findings reinforce the distinction between accepting technology as useful and being able to implement it effectively in practice.

The second theme demonstrates that the barriers extend beyond basic device operation. Participants also reported difficulties in developing instructional media and adapting them to lesson content. This suggests that procedural technological competence alone may not be sufficient for pedagogically meaningful media use. Teachers must also decide which types of media are appropriate for particular learning objectives, subject matter, student needs, and

available instructional time. Hasanah et al. (2023) emphasized the importance of matching multimedia with instructional needs in elementary education, while Falah et al. (2023) identified difficulties in developing digital instructional media. Studies by Anastasha and Hesti (2024) and Merianti and Lasari (2023) further suggest that appropriately designed media may enhance students' learning experiences. However, the present study adds an important teacher-centered perspective: pedagogical value must be balanced against the perceived workload involved in creating and adapting instructional media. In other words, even potentially effective media may remain underused when teachers perceive the preparation process as overly complex.

A particularly important contextual contribution of this study concerns perceived time cost. Several participants explicitly related the use of instructional media to the 35-minute lesson period available in their teaching context. This suggests that technology integration is not only a matter of competence but also a matter of perceived workload and temporal efficiency. The pattern emerging from the data can be conceptualized as follows:

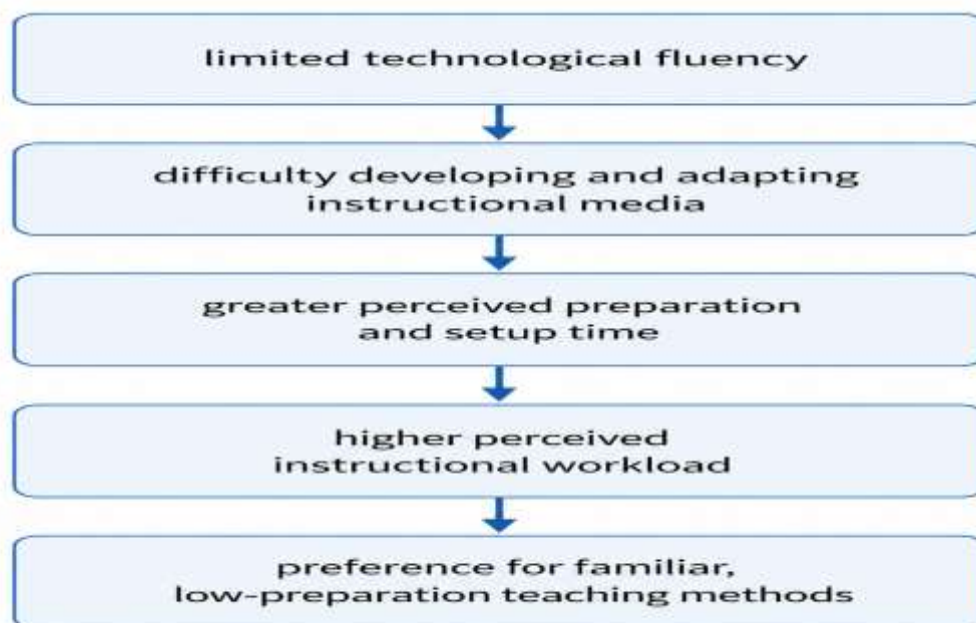


Figure 1. Conceptual pattern of research findings

This interpretive model illustrates why the three themes should not be treated as isolated or parallel barriers. When teachers have limited technological fluency, preparation may take longer; when developing and adapting media is also perceived as difficult, the perceived time cost increases further. Under these circumstances, lecture-based instruction may be preferred not because teachers reject innovation, but because it is familiar, immediately deployable, and perceived as more compatible with restricted instructional time. Accordingly, perceived time cost may function as a mechanism linking limited technological fluency with pedagogical

choices. This conceptualization offers a more analytically meaningful contribution than simply stating that “instructional media take too much time.”

These findings should also be interpreted carefully within the specific context of SD Negeri Sungayang. The study reflects the experiences of four teachers in a single school and is not intended to support broad generalization to all rural elementary schools. The data indicate that some teachers relied on colleagues for assistance in developing or using digital media, experienced difficulty connecting laptops to projectors, and considered both dense lesson content and limited instructional time when choosing teaching methods. Therefore, local factors such as collegial support, established teaching routines, prior technological exposure, and lesson-time structures should be taken into account when designing support strategies. The findings should also avoid age-based generalization. Participants’ references to long-established manual teaching practices are more appropriately interpreted as reflecting limited prior exposure to digital technologies and established instructional routines, rather than as evidence that age itself causes lower technological competence.

The practical implications of the findings suggest that increasing digital media use may require more than simply providing devices or offering generic technology training. Professional support should help teachers connect technological skills with concrete pedagogical decisions, such as selecting media that match instructional content, operating devices efficiently, adapting existing digital resources, and reducing preparation demands. Within this framework, peer mentoring may represent a potentially appropriate response, particularly because some participants already reported seeking assistance from colleagues when using or creating digital media. However, peer mentoring was not tested in this study and should therefore be presented as an implication rather than an established finding. The same caution applies to the development of a *ready-to-use digital media repository*. A curriculum-aligned repository requiring minimal preparation time may help reduce teachers’ workload, but its effectiveness should be evaluated empirically in future research. Accordingly, the earlier recommendation that media should be usable “within less than five minutes” should be removed because that threshold was not derived from the present data.

More broadly, the findings imply that professional development should move beyond training focused solely on “how to operate technology” toward support that addresses “how to use technology pedagogically and efficiently.” This orientation is consistent with the TPACK framework because it positions technology as part of pedagogical decision-making rather than as an isolated technical competence (Mishra & Koehler, 2006; Phillips et al., 2025). Potentially relevant forms of support include peer mentoring, *in-house training*, demonstrations of simple media use, adaptable digital templates, and resource sharing among teachers. Nevertheless, the effectiveness of these approaches should be treated as an agenda for future research because the present study did not implement or evaluate any intervention.

Several limitations should be acknowledged. First, the study was conducted at a single school with only four participants, meaning that the findings are highly contextual and their transferability to other settings should be assessed in relation to contextual similarity. Second, the data were derived primarily from self-reported interview accounts, and therefore represent teachers' perceptions rather than direct evidence of actual classroom practices. Third, limited classroom observation prevented systematic comparison between what teachers reported and how technology was actually used during instruction. Fourth, the study did not formally assess all TPACK domains; consequently, interpretations concerning TK and TPK should be understood as analytical interpretations rather than competence diagnoses. Fifth, the rural school context was not described in detail in terms of internet access, number of available devices, infrastructure reliability, and institutional support, which further limits transferability. Future research should therefore consider multisite designs, combine interviews with classroom observations and document analysis, compare teachers with different levels of technological experience, and empirically examine whether peer mentoring, ready-to-use media repositories, or TPACK-oriented professional development can reduce *perceived time cost* and support more sustained use of digital instructional media.

Overall, the study suggests that limited digital media integration at SD Negeri Sungayang is best understood as an interconnected process involving technological capability, pedagogical adaptation, and perceptions of time cost, rather than as a single competence deficit.

CONCLUSION

The findings indicate that the limited use of digital instructional media at SD Negeri Sungayang was perceived by participating teachers as the result of interconnected constraints involving digital technology operational skills, difficulties in developing and adapting instructional media, and substantial time demands associated with media preparation and use. These three dimensions formed an interrelated pattern: limited technological fluency may increase difficulties in designing or adapting instructional media, which in turn may increase the *perceived time cost* and instructional workload, leading some teachers to prefer more familiar teaching methods requiring less preparation. These findings can be interpreted primarily in relation to *Technological Knowledge* (TK) and *Technological Pedagogical Knowledge* (TPK), although they should not be regarded as a comprehensive diagnosis of teachers' overall TPACK competence. The main contribution of this study is therefore to demonstrate that digital media integration is associated not only with teachers' ability to operate technology, but also with their capacity to adapt technology pedagogically and manage perceived time demands within everyday classroom practice.

From a practical perspective, the findings suggest a need for more context-sensitive support that goes beyond the provision of technological devices or generic technology training. Peer mentoring, practice-oriented professional support, the use of instructional media requiring minimal preparation, and the development of curriculum-aligned, ready-to-use digital resources may be considered potential strategies for reducing teachers' preparation burden and improving the efficiency of digital media use. However, these strategies were not empirically tested in the present study and should therefore be treated as implications that warrant further implementation and evaluation, rather than as proven solutions. Moreover, because the study involved only four teachers from a single school and relied primarily on self-reported interview data, the findings are intended to provide contextual insight rather than statistical generalization. Future research should involve a larger number of participants across multiple schools, combine interviews with classroom observations, and empirically examine whether peer mentoring, ready-to-use digital resources, or TPACK-oriented professional development can effectively reduce technological, media-design, and perceived time-related barriers.

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