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Assessing Teachers' Readiness and Infrastructure Needs for Digital Classroom Development through a Service-Learning Approach

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Abstract. Digital transformation in education requires a deep understanding of teacher readiness, infrastructure availability, and pedagogical needs. This study employs a service-learning approach to conduct a needs analysis for the development of a digital classroom at MTs Rambatan. The study involved 15 teachers who completed a 13-item online questionnaire distributed via Google Forms. Data were analyzed descriptively using frequency distributions to identify teachers' perceptions, readiness, and infrastructural conditions related to digital classroom implementation. Findings indicate strong recognition of the need for innovation, with 100% of teachers agreeing that innovation is necessary and 53% perceiving the current learning environment as inadequate. Teachers showed high optimism about digital classrooms, with 100% agreeing that they can improve learning interest and outcomes. Readiness levels were equally promising, as 60% reported being ready and 40% very ready to adopt digital classrooms; 100% also expressed the need for further training. However, ICT infrastructure remains insufficient: 40% rated device availability as inadequate, and only 7% considered it very adequate. Teachers at MTs Rambatan exhibit strong motivation, readiness, and awareness regarding digital classroom development. However, inadequate ICT infrastructure poses a major challenge that requires institutional support and strategic investment. Future research should expand the scope of participants and examine the effectiveness of digital classroom implementation through longitudinal and experimental methods.

Keywords: Digital classroom; service-learning; educational facilities; learning interest; learning outcomes; needs analysis

1. Introduction

Learning interest plays a vital role in shaping students' academic success, as it determines their willingness to participate actively in the learning process and influences their overall learning outcomes (Hendrawijaya, 2022; Permatasari et al., 2019; Syamsuddin et al., 2021). Prior studies consistently show that students with higher levels of interest exhibit stronger motivation, deeper engagement, and better academic performance (Agger & Koenka, 2020; Karlen et al., 2019; Troxler et al., 2023). Because

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learning interest is closely tied to instructional effectiveness, teachers must adopt learning approaches and utilize facilities that align with students' needs and learning characteristics (Karagiannopoulou & Entwistle, 2019; Kintu et al., 2017). Improving learning interest, therefore, requires not only thoughtful pedagogy but also supportive educational infrastructure that enhances students' opportunities to learn.

Facilities and infrastructure have long been recognized as essential components in influencing student engagement and learning quality. The Ministry of Education and Culture defines educational facilities as all resources both physical and non-physical that directly or indirectly support the learning process, including media, tools, technology, and the classroom environment (Oryzani, 2023; Sarkadi et al., 2020). In the era of rapid technological advancement, optimizing such infrastructure increasingly involves integrating digital tools that enrich learning experiences and provide students with more relevant and interactive learning environments. Numerous studies highlight the positive impacts of digital technology on motivation, engagement, and learning outcomes, demonstrating its role in transforming teacher-centered instruction into more dynamic, student-centered learning experiences (Mahapatra, 2020; Santos et al., 2022; Sunu, 2022).

Digital classrooms, technology-integrated learning spaces that facilitate interactive and flexible instruction are now essential in supporting effective 21st-century learning (Muhamad & Seng, 2022; Sumardi et al., 2020). Research indicates that digital classrooms can significantly enhance students' motivation, participation, and learning outcomes by offering more engaging, accessible, and collaborative learning opportunities (Momen et al., 2023; Singh, 2021; Zainil et al., 2023). In addition, digital learning environments empower students to explore information independently, develop their potential, and participate in meaningful learning activities aligned with the demands of Era Society 5.0. These benefits underscore the importance of examining and developing digital learning infrastructure that meets the needs of teachers and students at the school level.

To ensure that digital classroom development is relevant, contextual, and effectively implemented, it is crucial to begin with a systematic needs analysis. However, needs analysis is most meaningful when conducted through collaborative and participatory approaches that involve the real users of the system in this case, teachers at MTs Rambatan. A Service-Learning approach provides an appropriate framework for this purpose, as it integrates academic inquiry with community engagement, allowing researchers and teachers to work together to identify authentic needs, challenges, and expectations related to digital classroom readiness. Through cycles of observation, reflection, communication, and action, service-learning not only generates more accurate needs data but also empowers teachers as co-learners and co-designers in the innovation process.

Given the crucial role of digital learning environments in enhancing student interest and outcomes, and considering the importance of participatory collaboration in designing effective educational innovations, this study aims to identify the initial user needs for the development of a digital classroom at MTs Rambatan using a Service-Learning approach. The findings are expected to provide a strong foundation for designing a digital classroom model that is contextually meaningful, pedagogically relevant, and capable of increasing students' learning interest and academic achievement.

2. Methods

This study applied a Service-Learning approach as the methodological framework to

conduct a needs analysis for digital classroom development at MTs Rambatan. Service-learning combines academic inquiry with direct community engagement, allowing researchers to collaborate with teachers as active partners throughout the research process (Resch & Schrittesser, 2023; Saeed & Ahmed, 2021; Warner, 2020). This approach ensures that the needs analysis is grounded in authentic experiences, real challenges, and contextual insights from the teachers who will utilize the digital classroom. By involving teachers directly, the study promotes shared ownership and supports the development of learning innovations that are meaningful and responsive to school needs.

The service-learning process was carried out through several interconnected stages: orientation, observation, collaboration, reflection, and action planning. During orientation, the researchers introduced the study's objectives and explained the service-learning cycle to teachers at MTs Rambatan. The observation stage involved joint exploration of existing facilities, teaching practices, and technological barriers. In the collaboration stage, researchers and teachers engaged in discussions and feedback sessions to identify priorities for digital classroom development. Reflection was conducted continuously to ensure that teachers' experiences and perspectives were accurately documented. Through these stages, the service-learning approach ensured that the data collected remained participatory, contextual, and reflective of actual needs.

The participants in this study consisted of 15 teachers from MTs Rambatan. Data for the needs analysis were obtained through a thirteen-item questionnaire distributed via Google Forms and completed online by the respondents. The questionnaire focused on the availability of learning facilities, teachers' readiness to use digital tools, and expectations for digital classroom development. The collected data were analyzed descriptively using frequency distribution tables, allowing the researchers to identify dominant patterns, recurring needs, and priority areas for development. The combination of structured data collection and collaborative engagement strengthened the validity of the needs analysis and provided a comprehensive foundation for the digital classroom development plan.

3. Results and Discussion

3.1. Teachers' Recognition of the Need for Innovation and Their Readiness for Digital Classroom Implementation

The findings show that teachers at MTs Rambatan have a strong awareness of the need for innovation in the learning process. This is evident from the responses indicating that 100% of participants consider innovation necessary, with 53% stating it is "necessary" and 47% "very necessary." Similarly, teachers expressed a strong belief that the current learning environment remains inadequate, as 53% identified it as insufficient, suggesting that existing learning facilities and conditions do not optimally support student engagement. The use of blended learning methods, reported by 60% of teachers, demonstrates a moderate level of technology adoption, although 40% have never applied it, indicating that some teachers still require additional exposure and practice in technology-assisted instructional models.

Teachers also expressed strong readiness for the implementation of digital classrooms, with 60% stating they are ready and 40% very ready, showing a high level of acceptance toward integrating technology into classroom practice. Likewise, teachers' self-assessed digital competence is encouraging, as 60% reported being capable and 40% very capable of operating ICT devices such as laptops and smartphones for learning. These data suggest that while teachers recognize the necessity of innovation, they also possess

sufficient readiness and basic digital literacy skills to support the transition toward digital-based learning environments. However, this readiness must be strengthened through structured capacity-building programs, as 100% of teachers expressed the need for training in the use of digital classrooms. This highlights the crucial role of professional development, ensuring teachers can effectively plan, implement, and evaluate learning activities within a digital ecosystem.

Table 1 Teachers' Recognition of the Need for Innovation and Their Readiness for Digital Classroom Implementation

No	Indicator	Response Category	Percentage
1	Need for learning innovation	Necessary	53%
		Very Necessary	47%
2	Current learning environment condition	Not Adequate	53%
		Adequate	47%
3	Use of blended learning	Have used	60%
		Have never used	40%
4	Readiness for digital classroom implementation	Ready	60%
		Very Ready	40%
5	Ability to operate ICT devices	Capable	60%
		Very Capable	40%
6	Need for digital classroom training	Need Training	100%

Table 1 illustrates that teachers at MTs Rambatan demonstrate strong awareness and readiness for digital-based learning innovation. All respondents (100%) acknowledged the importance of innovation, although this recognition contrasts with the current learning environment, which 53% of teachers consider inadequate to support effective learning. The adoption of blended learning shows a moderate level of technological integration, with 60% of teachers having implemented it, while 40% have not yet gained such experience. Teacher readiness for digital classroom implementation is also notably high, with 60% indicating they are "ready" and 40% "very ready," supported by their self-reported ability to operate ICT devices, 60% "capable" and 40% "very capable." Nevertheless, the universal need for training (100%) highlights that despite their readiness and basic digital literacy, teachers still require structured professional development to ensure they can effectively plan, manage, and evaluate learning activities within a digital classroom environment.

3.2. The Potential of Digital Classrooms to Enhance Learning and the Challenge of Inadequate ICT Infrastructure

The second cluster of findings highlights teachers' strong optimism about the educational impact of digital classrooms. All respondents agreed that digital classrooms are needed to enhance student comfort, with 67% considering them necessary and 33% very necessary. Furthermore, teachers believe digital classrooms have the potential to significantly enhance student learning interest and outcomes. This is reflected in the responses showing that 100% agree or strongly agree that digital classrooms can increase both learning interest (53% agree; 47% strongly agree) and learning outcomes (67% agree; 33% strongly agree). Teachers also demonstrate a holistic understanding of digital

classrooms, with 100% agreeing that they represent a comprehensive learning environment, not merely digital media. These findings reinforce the view that digital classrooms can create engaging, dynamic, and student-centered learning experiences, consistent with research demonstrating the positive influence of digital tools on motivation, participation, and achievement.

Despite this optimistic perception, the findings also point to a significant challenge namely ICT infrastructure. The availability of ICT devices in schools is still insufficient, with 40% of teachers labeling it inadequate and only 7% considering it very adequate. This indicates that infrastructure remains a key barrier to the effective implementation of digital classrooms. Adequate facilities such as computers, stable internet access, and digital learning tools are essential for ensuring the success of digital learning environments. Additionally, teachers emphasized the importance of institutional support, with 100% of respondents agreeing on the need for policy development and collaboration among the school community to sustain digital innovation. This underscores that the success of digital classrooms requires not only technological readiness but also structural support in the form of regulations, shared commitment, and coordinated efforts among school stakeholders.

Table 2 Teachers' Perceptions of the Potential of Digital Classrooms and ICT Infrastructure Availability

No	Indicator	Response Category	Percentage
1	The need for digital classrooms to enhance student comfort	Necessary	67%
		Very Necessary	33%
2	Digital classrooms can increase student learning interest	Agree	53%
		Strongly Agree	47%
3	Digital classrooms can improve student learning outcomes	Agree	67%
		Strongly Agree	33%
4	Digital classrooms as a comprehensive learning environment	Agree	100%
5	Availability of ICT devices in schools	Not Adequate	40%
		Adequate	53%
		Very Adequate	7%
6	The need for policy development and collaboration for digital innovation	Agree	100%

Table 2 illustrates teachers' strong belief in the educational benefits of digital classrooms, with all respondents affirming that they are essential for increasing student comfort, learning interest, and learning outcomes. Teachers also demonstrate a comprehensive understanding of digital classrooms as a holistic learning ecosystem rather than merely digital media. However, despite this positive perception, the data reveal a critical challenge: inadequate ICT infrastructure. With 40% of teachers stating that device availability is not adequate and only a small percentage viewing it as very adequate, the findings highlight that infrastructural limitations remain a major barrier to

effective digital classroom implementation. Teachers also unanimously agree on the need for institutional policies and collaborative efforts, indicating that technological readiness must be supported by strong structural and organizational commitment to ensure successful and sustainable digital innovation.

Figure 1 a. Service-Learning Activities with MTs Rambatan Teachers, b. Group Photo with MTs Rambatan Teachers

Figure A shows the atmosphere of the service-learning activity conducted with teachers at MTs Rambatan, where teachers actively participated in discussions, needs identification, and collaborative reflection regarding the development of digital classrooms. Figure B captures a group photo of the MTs Rambatan teachers together with the service-learning team, symbolizing partnership, shared commitment, and collective enthusiasm toward improving digital-based learning. Together, these two images illustrate both the process and the spirit of collaboration that underpin the service-learning approach implemented in this community engagement activity.

3.3. Digital Classrooms as a Catalyst for Enhanced Learning

The findings of this study clearly indicate that teachers at MTs Rambatan hold strong confidence in the transformative potential of digital classrooms to enhance student learning. This aligns with the constructivist learning theory, which emphasizes the role of interactive and technology-supported environments in facilitating deeper learning experiences. According to Vygotsky's Zone of Proximal Development (ZPD), learners are better supported when instructional tools extend their cognitive capabilities, and digital classrooms serve exactly this function by providing flexible, multimodal, and student-centered learning pathways (Eun, 2019; Ferguson et al., 2022; Margolis, 2020). The teachers' unanimous agreement that digital classrooms strengthen learning interest and outcomes suggests that digital environments are increasingly perceived as vital mediators in modern pedagogy.

The high level of teacher agreement regarding digital classrooms as a comprehensive learning ecosystem reflects growing alignment with the principles of Technological Pedagogical and Content Knowledge (TPACK). This framework highlights the importance of integrating technology not merely as an add-on but as a core component shaping pedagogy and content delivery (Farikah & Al Firdaus, 2020; Mulyadi et al., 2020; Scherer et al., 2017; Tanjung et al., 2022). Teachers' perceptions that digital classrooms improve comfort, motivation, and engagement mirror previous studies showing that technology enhances students' active participation and autonomy. When teachers recognize digital

tools as integral to the learning environment, it signals a shift toward more holistic and technology-supported instructional paradigms.

The optimism surrounding the benefits of digital classrooms also resonates with Self-Determination Theory (SDT), which posits that motivation increases when learners experience autonomy, competence, and relatedness (Chiu, 2024; Xia et al., 2022). Digital classrooms through interactive platforms, collaborative tools, and multimedia resources create opportunities for students to feel more empowered and connected in the learning process. The teachers' strong belief that digital technology increases motivation and learning outcomes reinforces this theoretical orientation. In essence, teachers perceive digital classrooms as spaces where students can explore, interact, and construct knowledge in more meaningful ways.

However, despite the strong conceptual alignment between teacher perceptions and these theoretical foundations, significant structural barriers remain particularly inadequate ICT infrastructure. This limitation resonates with the Diffusion of Innovation Theory proposed by Rogers (Call & Herber, 2022; Yu, 2022), which asserts that innovation adoption is influenced by organizational support, resource availability, and access to enabling technologies. Even when individuals (in this case, teachers) demonstrate high readiness and openness to innovation, the absence of supporting infrastructure slows down the diffusion process. The finding that 40% of teachers view ICT availability as inadequate highlights a systemic gap that must be addressed for digital classrooms to be implemented effectively.

The teachers' collective recognition of the need for policy development and collaboration further underscores the importance of supportive organizational ecosystems. This aligns with the Sociotechnical Systems Theory (Lee et al., 2022; Walker et al., 2008), which emphasizes that technological innovations succeed only when both technical and social subsystems are aligned. Teachers' call for structured institutional support suggests that digital transformation in education cannot rely solely on individual willingness or competence; rather, it requires coordinated efforts, clear regulations, and shared responsibility among school stakeholders. Such alignment is critical to ensuring that digital classrooms move beyond pilot implementation and evolve into sustainable educational practices.

The findings affirm that digital classrooms hold significant promise for improving learning processes, motivation, and outcomes, consistent with contemporary educational theories. Yet, this potential can only be realized through holistic interventions that address infrastructure limitations, strengthen teacher capacity, and institutionalize supportive policies. The interplay between teacher readiness, pedagogical theory, and structural conditions reveals that digital learning innovation is both a pedagogical and systemic endeavor. Addressing these interrelated factors will allow schools to fully leverage digital classrooms as catalysts for meaningful, equitable, and future-oriented learning.

4. Conclusions

The findings of this study reveal a strong collective awareness among teachers regarding the need for innovation in the learning process at MTs Rambatan. A total of 100% of teachers acknowledged the necessity of innovation, and 53% even perceived the current learning environment as inadequate. Similarly, the need for digital classroom development was clearly recognized, with 100% agreeing or strongly agreeing that digital

classrooms could increase learning interest and outcomes. Teachers also demonstrated noteworthy readiness for implementation, as 60% declared themselves ready and 40% very ready, supported by comparable levels of ICT capability. These findings affirm that the teaching community is not only conscious of pedagogical challenges but also prepared to adopt technology-driven solutions.

The discussion reinforces that these empirical findings align with theoretical perspectives on digital learning environments and service-learning pedagogy. The teachers' optimism, reflected in 100% agreement regarding the pedagogical value of digital classrooms supports literature that emphasizes digital technology as a catalyst for improving motivation, engagement, and learning outcomes. However, the study also uncovered a significant structural barrier: ICT infrastructure. With 40% of teachers rating device availability as inadequate and only 7% very adequate, the implementation of digital classrooms faces logistical challenges that necessitate institutional planning and investment. These findings highlight that successful digital transformation is contingent not only upon teacher readiness but also upon systemic support, including policies, facilities, and collaborative engagement.

This study acknowledges several limitations. The needs analysis involved only 15 teachers, limiting the generalizability of the results. The research relied solely on descriptive survey data, without classroom observation or interviews that might provide deeper insight into contextual challenges. Future research should involve a larger sample, triangulate data sources, and evaluate the actual implementation of digital classrooms through experimental or quasi-experimental designs. Longitudinal studies are also recommended to examine how teacher readiness, digital competence, and infrastructure improvements collectively influence student motivation and learning outcomes over time.

Conflict of Interest

The authors declare no conflict of interests.

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