



Digital Technology-Based Educational Innovation at Percut Sei Tuan State Junior High School 4

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ABSTRACT

Digital technology-based educational innovation has become an important strategy for improving learning quality in the era of digital transformation. This study aims to analyze the implementation of digital technology-based educational innovation at Percut Sei Tuan State Junior High School 4, with a focus on the optimization of technology use, teacher and school readiness, and the role of school leadership in supporting digital-based learning. This research employed a qualitative approach with a phenomenological design. Data were collected through interviews, observations, and documentation involving school principals, teachers, administrative staff, and students who were directly engaged in digital learning practices. The data were analyzed through data reduction, data display, and conclusion drawing. The findings show that digital technology has been used in learning and school administration through laptops, projectors, smart TVs/interactive flat panels, Canva, Google Forms, digital attendance systems, and digital report card systems. These technologies support more interactive, effective, and student-centered learning. However, implementation remains constrained by limited facilities, unequal teacher digital competence, and the need for continuous training. The study concludes that successful digital technology-based educational innovation depends on the integration of adequate infrastructure, teacher readiness, institutional support, and adaptive school leadership.

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INTRODUCTION

Education cannot be separated from innovation; the two are interrelated. Educational innovation can be understood as something new for a person or group aiming to achieve a specific goal or solve a problem (Muhibburrohman et al., 2024). Educational innovation is expected to have a positive impact on the community, helping develop skills in economic, social, and other fields. Critical, creative, and imaginative thinking, subject-matter expertise, and emotional intelligence are the keys to successful innovation. To innovate, a strategy is needed.

Conventional one-way learning methods are now shifting toward an interactive, technology-based approach. This allows students to be more active in understanding the material and developing critical skills (Riyadi & Emah Khuzaemah, 2025). In addition, technology enables varied learning methods, such as interactive videos, digital simulations, and artificial intelligence-based learning platforms (Jusman & Parisu, 2025). With this approach, students can learn at their own pace and have access to a wider range of resources. Educators can also leverage technology to provide real-time feedback, making learning more effective and efficient.

First of all, digital technology has changed the learning methods used in the Education environment. carried out at Percut Sei Tuan State Junior High School 4, traditional learning methods are often dominated by teacher-led lectures and passive student learning. However, with advances in digital technology, a more interactive, collaborative, and problem-based approach to learning has become possible. Students can now engage in more interactive learning experiences, utilizing multimedia resources, simulations, and diverse learning software. This method encourages active student participation, direct involvement in problem-solving, and critical thinking, which, in turn, can improve students' understanding and skills.

Educational innovation is closely related to the ability of schools to introduce new ideas, methods, and systems that can improve the quality of learning (Ridwan et al., 2024). In technology-based education, innovation does not only refer to the availability of digital devices, but also to how teachers integrate technology into teaching strategies, how students engage with digital learning media, and how school leaders support the implementation of digital transformation. Ambarwati et al. (2021).explain that educational innovation plays an important role in improving learning practices through the use of digital technology. Similarly, Falah et al. (2025) emphasize that digital-based learning strategies can support more adaptive and differentiated learning processes.

The integration of digital technology in schools provides various opportunities for improving learning quality. Digital media can help teachers present learning materials more creatively, provide faster feedback, and create learning experiences that are more attractive to students. Digital technology also enables students to access learning resources more widely and participate more actively in the learning process. However, the success of digital technology-based educational innovation does not depend solely on the availability of technological devices. It is also influenced by teacher readiness, school infrastructure, institutional support, and leadership commitment.

In practice, many schools still face challenges in optimizing the use of digital technology. Some teachers are able to use digital media such as PowerPoint, Canva, learning videos, Google Forms, and other online platforms (Miftahul Huda et al., 2025; Purnomo, 2024; Ricky Ekaristy Purwadi et al., 2024). However, the level of digital competence among teachers is often uneven. Some teachers still experience difficulties in designing technology-based learning, selecting appropriate digital media, and integrating technology into student-centered learning activities. Kartika & Hastari (2022) state that teachers in the digital era need to develop digital literacy, media literacy, and technological skills to support effective teaching. This means that teacher readiness

is not only related to technical ability, but also to pedagogical competence in using technology meaningfully.

A similar condition can be found at Percut Sei Tuan State Junior High School 4. The school has begun to implement digital technology in both learning and school administration. Teachers have used digital media, such as laptops, projectors, Canva, learning videos, and Google Forms, while the school has also implemented digital-based systems in attendance, assessment, and report card management. These practices show that the school has made efforts to respond to digital transformation (Daulay & Harahap, 2024). Nevertheless, the implementation has not been fully optimal. The use of technology still varies across subjects, facilities remain limited, and teacher digital competence is not evenly distributed. As a result, digital technology has not yet been fully integrated into all learning designs (Rohman et al., 2023).

Previous studies have generally discussed digital technology in education by focusing on its benefits for learning effectiveness, digital literacy, and technology-based instructional media. Several studies have also examined teacher competence and digital learning strategies (Arisanti, 2025; Budiarto et al., 2026). However, there is still a need for more specific studies that examine digital technology-based educational innovation at the school level by connecting three important aspects: the optimization of technology use in learning, teacher and school readiness, and the role of school leadership. This gap is important because digital innovation in schools cannot be understood only from the perspective of technology use, but must also be examined through institutional readiness and leadership support.

Based on this background, this study aims to analyze digital technology-based educational innovation at Percut Sei Tuan State Junior High School 4. Specifically, this study focuses on the optimization of digital technology use in learning, teacher readiness in integrating technology, school readiness in supporting digital-based education, and the role of school leadership in encouraging digital innovation. This study is expected to contribute to the development of educational innovation studies, particularly in understanding how digital technology can be implemented more systematically to support interactive, effective, and student-centered learning in junior high schools.

METHOD

This study uses a qualitative, phenomenological design to describe the experiences and impacts of implementing digital technology-based educational innovations at Percut Sei Tuan State Junior High School 4. This design was chosen to explore in depth how the use of digital technology can improve the effectiveness of learning, teacher-student interaction, and the quality of digital technology in the learning process (Ardiansyah et al., 2023; Hasibuan et al., 2022). This research was conducted at Percut Sei Tuan State Junior High School 4, located at Jl. Hamidin Haman No. 1A, Percut Village, Percut Sei Tuan District, North Deli Serdang Regency, Postal Code 20371. The research was carried out over approximately 2 months, including the pre-field stage, data collection, data analysis, and the preparation of scientific reports.

Participants in this study were selected using a purposive sampling method. Selection was based on their direct involvement in the implementation of digital technology-based educational innovations at Percut Sei Tuan State Junior High School 4. Participants consisted of teachers and students. Participant selection criteria included their experience in using digital technology in learning or school administration, their direct involvement in digital-based school programs, and their willingness to provide information related to the research focus.

Secondary data are collected through documentation, including school documents related to digitalization of learning programs, school profiles, school vision and mission, reports on media-based learning activities or digital platforms, and literature reviews from relevant journals, books, and scientific articles. Data collection techniques are carried out gradually and systematically through in-depth interviews, direct observations, and documentation to obtain a comprehensive picture of digital technology-based educational innovations in the school. Data analysis techniques involve data reduction, data presentation, and conclusion drawing. Data reduction involves sorting and simplifying data relevant to the research focus. The reduced data is then presented in the form of a specific narrative, table, or category to identify patterns and relationships among the findings. (Qomaruddin & Sa'diyah, 2024). Furthermore, the researcher concludes by interpreting the data, connecting it with theory, and concluding the effectiveness and challenges of applying digital technology in education.

FINDINGS

Optimizing the Utilization of Digital Technology to Support Learning.

The findings show that digital technology has been used in the learning process at Percut Sei Tuan State Junior High School 4 through various devices and applications, including laptops, projectors, smart TVs or interactive flat panels, PowerPoint, Canva, learning videos, Google Forms, and other digital-based learning media. These technologies are used by teachers to present learning materials, design interactive activities, conduct evaluations, and increase student participation during classroom learning. The principal stated that the use of digital technology has become part of the school's effort to adapt learning to current educational needs. Teachers are encouraged to use digital devices and applications to make learning more effective and relevant to students' characteristics in the digital era. This policy is reflected in classroom practices where teachers use presentation media, visual materials, learning videos, and online quizzes to support the teaching and learning process.

Teachers also reported that digital technology helps them deliver learning materials in more varied and attractive ways. Applications such as Canva and PowerPoint are used to prepare presentations, learning videos, and simple educational games. Google Forms is also used to conduct learning evaluations because it allows teachers to collect students' responses more quickly and efficiently. From the students' perspective, the use of digital technology makes learning more interesting and easier to understand. Students stated that visual materials, learning videos, and digital quizzes help them become more engaged in classroom activities. The use of digital media

also increases their motivation because learning feels less monotonous and more interactive. However, the use of digital technology has not been fully distributed across all subjects. Some teachers have actively integrated digital tools into their teaching, while others still use technology only as a supporting medium. This indicates that the optimization of digital technology in learning still needs to be strengthened so that technology is not merely used as an additional tool, but becomes part of the learning design.

Teachers' Readiness to Integrate Digital Technology into Learning in the Digital Transformation Era

The findings indicate that teacher readiness in integrating digital technology is relatively good, although it is not evenly distributed among all teachers. Several teachers have shown the ability to use digital applications, create learning media, conduct digital assessments, and adapt digital tools to classroom needs. They use technology to support presentation, explanation, evaluation, and student engagement. Teachers who are more familiar with digital tools tend to be more creative in designing technology-based learning. They use applications such as Canva, PowerPoint, learning videos, Google Forms, and Learning Management System-based platforms to make learning more interactive. These teachers also show openness to technological change and are willing to learn new applications to improve classroom learning.

Nevertheless, the findings also show that some teachers still face difficulties in using digital technology. The obstacles include limited digital skills, differences in age and experience, lack of confidence in operating certain applications, and limited ability to design digital learning media. Some teachers are able to operate basic digital tools, but still need guidance in integrating technology into more student-centered learning activities. The school has attempted to address these challenges through training, discussion forums, and peer learning among teachers. Teachers who have better digital competence often assist other teachers in using digital applications. This practice helps create informal collaboration among teachers and supports the gradual improvement of digital competence.

School Readiness in Responding to Digital Technology-Based Educational Innovations in Learning

School readiness can be seen from the availability of digital facilities, digital administration systems, and institutional support for technology-based learning. Percut Sei Tuan State Junior High School 4 has provided several supporting facilities, including Wi-Fi access, computer laboratories, digital libraries, projectors, smart TVs or interactive flat panels, and other learning support devices. In addition to learning facilities, the school has also implemented digital systems in school administration. The administrative staff reported that digital technology is used in managing school data, attendance, teacher performance administration, digital assessments, and report card systems. This finding indicates that digital transformation at the school is not limited to classroom learning but also includes school governance and administrative services.

The students also confirmed that the school provides support for digital learning. Most students are already accustomed to using mobile phones and digital platforms for learning activities and online examinations. For students who do not have personal devices, the school provides access to computer laboratories to support participation in digital-based learning activities. However, school readiness still faces several limitations. The number of digital devices is not yet sufficient to support all learning activities equally. Some classrooms still have limited access to technological equipment, and the availability of facilities such as projectors, smart TVs, or interactive flat panels remains uneven. These limitations affect the consistency of technology use across different subjects and classrooms.

The Role of Leaders in Supporting Digital-Based Education Innovation in the Learning Process

The findings show that the principal plays an important role in supporting digital technology-based educational innovation. The principal acts as a policymaker, facilitator, motivator, and evaluator in the implementation of digital-based learning. Leadership support is provided through school policies, budgeting, facility provision, teacher training, and coordination with teachers, students, parents, and other stakeholders. The principal encourages teachers to use digital technology in the learning process and provides direction so that technology is understood as a tool to support education, not as an obstacle. This leadership role is reflected in the school's effort to provide digital facilities, develop technology-based programs, and support teachers in improving their digital competence.

Teachers stated that school leaders provide policies and directions related to the implementation of digital technology-based learning. The school also supports teachers through training, workshops, mentoring, and collaboration with external parties. These activities are intended to improve teachers' ability to use learning applications, create digital media, and implement more innovative learning strategies. Students also felt the impact of leadership support through the availability of facilities such as Wi-Fi, computer laboratories, and digital learning devices. They stated that these facilities help them participate in digital learning more easily. Teachers also guide students in using technology appropriately for learning purposes. Overall, the findings indicate that leadership support is one of the key factors in the implementation of digital technology-based educational innovation at Percut Sei Tuan State Junior High School 4. The principal's role is not limited to providing instructions, but also includes building a school culture that is open to technological change.

DISCUSSION

Optimizing the Utilization of Digital Technology to Support Learning at Percut Sei Tuan State Junior High School 4

The use of digital technology in learning at Percut Sei Tuan State Junior High School 4 shows that technology has become an important medium for creating more interactive and student-centered learning. Teachers use digital media to present material visually, design learning

activities, conduct online assessments, and increase student participation. This finding supports the view that digital technology can help teachers create more flexible, creative, and engaging learning experiences (Khotimah et al., 2026).

However, the findings also show that the use of technology has not been fully optimized across all subjects. Some teachers have used digital media creatively, while others still use technology only as a complementary tool. This condition indicates that digital technology has not yet been fully integrated into the instructional design. In other words, technology is already present in the classroom, but its pedagogical use still needs to be strengthened.

This finding is in line with Ambarwati et al. (2022), who explain that educational innovation through digital technology requires changes not only in learning media, but also in learning strategies. Digital innovation becomes meaningful when technology is used to support student engagement, critical thinking, collaboration, and independent learning. Therefore, the use of Canva, PowerPoint, Google Forms, and learning videos should not only function as presentation tools, but also as instruments to build active learning.

From the perspective of innovation diffusion theory, the adoption of digital technology in schools depends on how users perceive its usefulness, ease of use, compatibility with learning needs, and institutional support. In the context of this study, teachers and students generally perceive digital technology as useful because it makes learning more interesting and easier to understand. Nevertheless, limited facilities and uneven digital competence slow down the optimization process. This means that the innovation has been adopted, but its implementation is still at the stage of gradual adaptation.

Teachers' Readiness in Integrating Digital Technology into Learning in the Digital Transformation Era at Percut Sei Tuan State Junior High School 4.

Teacher readiness is one of the central factors in the success of digital technology-based educational innovation. The findings show that several teachers at Percut Sei Tuan State Junior High School 4 are already able to use digital media, online assessment tools, and learning applications. They also show openness to technological change and willingness to improve their digital competence. This indicates that teacher readiness is not only technical, but also related to attitude, motivation, and adaptability.

Nevertheless, teacher readiness is not evenly distributed. Some teachers still experience difficulties in using digital applications, designing digital learning media, and integrating technology into student-centered learning. Differences in age, teaching experience, confidence, and access to training influence teachers' ability to adapt to digital-based learning. This condition confirms that digital transformation in schools cannot be achieved only by providing technological infrastructure. It must also be supported by continuous professional development.

The findings are relevant to the Technological Pedagogical Content Knowledge framework proposed by Mishra and Koehler. This framework emphasizes that effective technology integration requires the balance of three forms of knowledge: technological knowledge, pedagogical knowledge, and content knowledge. Teachers are not only expected to operate digital

tools, but also to understand how technology can support certain learning objectives, fit the characteristics of students, and strengthen the delivery of subject matter (Martin et al., 2021).

In this study, teachers who are able to combine digital applications with learning objectives tend to use technology more meaningfully. For example, Google Forms is not only used to collect answers, but also to conduct faster evaluation. Canva and PowerPoint are not only used for visual presentation, but also to help students understand abstract concepts more easily. This shows that teacher readiness must be understood as the ability to transform technology into pedagogical practice.

The school's efforts to provide training, discussion forums, and peer learning are important steps to reduce gaps in teacher competence. Peer learning is particularly useful because teachers who are more competent in digital technology can assist other teachers in practical and contextual ways. This collaborative strategy can help create a school culture where digital competence develops collectively, not individually.

School Readiness in Responding to Digital Technology-Based Educational Innovations in Learning at Percut Sei Tuan State Junior High School 4

The readiness of schools to respond to digital technology-based educational innovations can be seen in various aspects, including policies, facilities and infrastructure, and system support. Based on the research results, Percut Sei Tuan State Junior High School 4 has shown a strong readiness to support the implementation of digital technology. The school has provided various supporting facilities, such as internet (Wi-Fi), computer labs, and other technological devices. In addition, the school has implemented digital systems across various areas, including teacher administration (SKP and PKG), an attendance system, and digital exams via online platforms. In fact, the school has developed a digital library that allows students to access a variety of learning resources online.

However, there are still some limitations, such as an inadequate number of computers and uneven devices across the classroom. To overcome this, the school made various efforts, including facilitating the use of students' personal devices (BYOD) and alternating use of computer laboratories. The school's readiness is also evident in the preparation of a special budget for technology development and in its commitment to continue updating facilities. In addition, schools collaborate with external parties, such as the education office, in order to improve the quality of digital technology implementation.

Theoretically, according to Rogers (1983) The success of an innovation is influenced by the organization's readiness to accept and implement change. In the theory of Diffusion of Innovations, readiness includes policy support, availability of resources, infrastructure, communication between organizational members, and institutional commitment to adopt innovation sustainably. The higher the organization's readiness to provide facilities and support systems, the greater the opportunity to implement innovation effectively. This theory aligns with research at Percut Sei Tuan State Junior High School 4, which shows that schools are quite ready to respond to digital technology-based educational innovations. This can be seen in the existence of school

digitalization policies, the provision of supporting facilities such as Wi-Fi, computer laboratories, and digital libraries, and the implementation of digital-based administrative and examination systems. Although the number of devices remains limited, the school's commitment to preparing technology development budgets and collaborating with external parties demonstrates ongoing efforts to support the implementation of digital innovation

The Role of Leadership in Supporting Digital-Based Education Innovation in the Learning Process at Percut Sei Tuan State Junior High School 4

The role of school principals as leaders greatly determines the success of the implementation of digital-based educational innovations. Based on the interview results, the principal at Percut Sei Tuan State Junior High School 4 has played an active role in supporting the use of digital technology. The principal provides support through flexible policies that give teachers the freedom to choose learning media that suit their material needs. In addition, the principal also provides teachers with permits and facilities to participate in training, both inside and outside the school. This support includes financing training, transportation, and providing opportunities to develop competencies.

One strategy applied is the scanning system, in which teachers who have participated in training are required to share the knowledge they have gained with other teachers. This allows all teachers to benefit from the training, though not all can participate in person. The principal also plays a role in providing facilities and infrastructure, including ensuring the availability of internet networks and technological devices. In addition, the principal actively motivates teachers to continue to innovate and not be afraid of technological developments.

In the face of various challenges, the principal encourages a collaborative approach in which problems are identified and solved together. Thus, a school culture that is open to change and innovation is created. Theoretically, according to Bass (2015) Transformational leadership is a leadership style that encourages change by motivating, supporting, inspiring, and empowering organizational members to achieve common goals. Transformational leaders not only serve as decision-makers but also as facilitators, creating an environment conducive to innovation, competency development, and organizational change.

This theory aligns with research at Percut Sei Tuan State Junior High School 4, which shows that school principals have played transformational leadership roles in supporting digital-based educational innovation. This can be seen in flexible policies, support for teacher training, the implementation of a knowledge-scanning system, the provision of infrastructure, and the motivation given to teachers to continue adapting to technological developments. The principal's collaborative approach also reflects efforts to build a school culture that is open to change and innovation.

CONCLUSION

Digital technology-based educational innovation at Percut Sei Tuan State Junior High School 4 has been implemented in learning and school administration through the use of digital devices, learning applications, online assessment tools, digital attendance systems, and digital report card systems. These innovations support more interactive, effective, and student-centered learning. However, implementation still faces several challenges, including limited facilities, unequal access to devices, and uneven teacher digital competence. The findings show that teacher readiness, school infrastructure, institutional support, and school leadership are essential factors in the success of digital innovation. Teachers need continuous training to integrate technology into meaningful learning practices, while school leaders need to provide clear policies, facilities, mentoring, and sustainable support. Thus, digital technology-based educational innovation should be developed as an integrated school strategy, not merely as the use of digital tools in learning.

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