

Using Digital Technology for Learning Quality: Descriptive Study at Junior High Schools in Mojokerto

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ABSTRACT

Objective: The use of digital technology is becoming increasingly widespread in Indonesian high schools through various strategies. This research aims to find out the forms or strategies of using digital technology along with its impact on learning. **Method:** Descriptive qualitative was used to analyse various findings at public junior high school 1 Bangsal and public junior high school 2 Gedeg Mojokerto. Purposive sampling was applied with data collected through interviews, observations and documentation to fulfil triangulation. **Results:** This research found that there are differences in the implementation of digital technology at public junior high school 1 Bangsal and public junior high school 2 Gedeg Mojokerto in terms of teaching practices and methods, as well as for activities like curriculum development and programme evaluation. Both schools still showed an overall improvement in learning outcomes ranging from 12-18%. **Novelty:** A review is being conducted on the effects of implementing various types of digital technology related directly or indirectly to learning from the perspective of those directly involved in both schools, which has yet to examine the success and challenges faced.

INTRODUCTION

Digitalising education has become a key agenda in transforming the learning system in the 21st century and in achieving the Sustainable Development Goals (SDGs) (Gupta, 2023; Palvia et al., 2018). Integrating digital technology is now part of efforts to optimise the learning process and develop skills, especially in Indonesia. This is an effort to optimise the implementation of the school curriculum, which now includes the independent curriculum and deep learning. Reviewing the implementation of digital technology use is important to ensure student learning outcomes meet the educational needs of the nation (James et al., 2025; Ramadhan et al., 2025; Sengupta & Shivendu, 2019).

It's been proven that digital technology has a positive impact on learning quality (Melta et al., 2026). Interestingly, its effectiveness really depends on how the technology is integrated into the teaching process. Poor integration can make the technology just a technical tool without significantly improving the quality of learning. When digital technology is used in line with learning objectives, it can boost students' motivation to learn. Digital learning technology also helps teachers design interactive lessons that suit the characteristics of their students (Shkurti, 2025).

Even so, not all schools can fully implement digital technology in learning. Various obstacles, from limited internet access to low school readiness, often hinder the use of digital technology in teaching. This shows that the implementation of digital technology in schools doesn't happen uniformly. On the other hand, some public junior high schools in Mojokerto, East Java have started progressing in implementing digital technology in learning. Based on initial research, public junior high school 1 Bangsal and public junior high school 2 Gedeg are two schools that have utilised various digital technologies, such as using projectors and Google Classroom to support teaching and learning activities.

Both schools also implement various management strategies such as curriculum

development and improving teacher competence related to integrating digital technology into learning. However, there is still no empirical review that truly confirms whether this is running smoothly. A deeper understanding is needed of how digital technology is used in learning practice, the strategies schools implement to support its implementation. This is important because each school has different strategies and levels of success (Chandafa & Fang, 2026; Ngcapu et al., 2020). It is also important to know what needs to be developed and what is still lagging to align with best practice.

The integration of digital technology in high school learning today can be explained using Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006). It involves using technology as a result of the interaction between technological knowledge, pedagogical knowledge, and content knowledge in students. During learning in deep learning or independent curriculum, the suitability of the technology used with the characteristics of the material is very important. For teachers, this is crucial in selecting and adapting the type of digital technology in learning to ensure learning outcomes are achieved.

TPACK is suitable as a tool to analyse the implementation of digital technology at public junior high school 1 Bangsal and public junior high school 2 Gedeg. The focus of the study is on the types of technology used and how they are integrated into teaching strategies, the role of schools in developing teachers' capacity to use technology, and the challenges that arise during the implementation process. This is important to identify the connections between technology, pedagogy, and learning materials in the practice of using digital technology in both schools.

Several previous studies have tried to dissect the implementation of digital technology in learning. Research from Duarte et al., (2025) and Rekha & Thangarajathi, (2026) shows that using digital technology can increase student engagement and broaden access to learning resources. Research from Hanifah & Nadlifatin, (2024) also highlights the importance of teacher competence in integrating digital technology into learning and the need for ongoing training to ensure optimal use of technology (Fernández-Cruz et al., 2024; Law, 2009). Additionally, several studies reveal that school leadership is an important factor in the successful implementation of digital technology (Adams, 2025; Rivera, 2024; Sun & Gao, 2019).

Based on the research above, studies on the implementation of digital learning technology still show fragmentation in terms of technology use effectiveness, teacher competence, and school principal leadership. Although these findings are important, there is still limited research explicitly explaining how the interaction between teachers' pedagogical strategies and school management mechanisms leads to the implementation of digital technology at the junior high school level, which is also quite rare in Indonesia. This gap is important because implementing digital technology is more than a technical issue; it also depends on how schools integrate pedagogical and organisational aspects into a single mechanism.

To answer this, this study aims to: 1. Understand the form or strategy of using digital technology in learning at public junior high school 1 Bangsal and public junior high school 2 Gedeg. 2. Identify the challenges faced in implementing digital technology use at public junior high school 1 Bangsal and public junior high school 2 Gedeg, and 3. Examine the impact of using digital technology in learning at public junior high school 1 Bangsal and public junior high school 2 Gedeg. In this study, the quality of learning refers

to the framework of the effectiveness of the learning process viewed from learning interactions and learning outcomes in technology-assisted learning. The novelty of this research lies in the case study analysis that highlights the relationship and comparison between pedagogical strategies and school management in the implementation of digital technology in the context of junior high schools, especially at public junior high school 1 Bangsal and public junior high school 2 Gedeg, which has never been done before.

These research findings provide a more comprehensive understanding of the factors that support the use of digital technology to improve learning quality. The study gives an overview of digital technology implementation practices that schools, teachers, and principals can use as a reference when developing technology-based learning.

RESEARCH METHOD

Research Design

This study uses a multiple-case study design with a descriptive qualitative approach. This design was chosen because the research aims to understand strategies for using digital technology, the challenges of its implementation, and the impact of digital technology on the quality of learning at public junior high school 1 Bangsal and public junior high school 2 Gedeg. A multiple-case study allows researchers to understand a phenomenon while identifying similarities and differences between the cases studied (Yin, 2017).

Through this design, the study describes phenomena at each school and carries out a cross-case analysis to identify patterns, characteristics, and differences in the implementation of digital technology at both schools. The research was conducted from March to May 2024 at public junior high school 1 Bangsal and public junior high school 2 Gedeg, Mojokerto Regency, East Java.

Research Participants and Data Collection

Research participants were selected using purposive sampling based on their involvement in implementing digital technology in schools. The total number of participants was 8, consisting of: 2 school principals, 2 vice principals for curriculum and facilities, and 4 subject teachers. Data were collected through semi-structured interviews, observation, and direct documentation at the research site.

Semi-structured interviews were conducted twice with each informant, lasting around 45–50 minutes per session. The interview questions covered: 1.) strategies for integrating technology into learning, 2.) challenges in implementing technology, and 3.) the impact of technology use on the learning process and outcomes. Non-participant observation was carried out in the classroom during lessons to directly see the forms of digital technology integration in teaching activities. Each observation session lasted for two lessons at each school. The documentation analysed included lesson planning documents, school programme reports, and archives of platform usage.

Participants from the school leadership were chosen because they play a role in decision-making, supervision, and the development of digital technology infrastructure in schools. Teachers were selected because they directly integrate digital technology into the learning process. The selection of public junior high school 1 Bangsal and public junior high school 2 Gedeg was based on: 1.) both schools have implemented digital technology in learning; 2.) having basic infrastructure support like internet access and

digital learning devices; 3.) showing commitment to the development of technology-based learning.

Table 1. Characteristics of Research Participants.

Position	Subject Area	Years of Experiences	Role in Digital Technology Implementation
Principal public junior high school 1 Bangsal	-	10+ years	School policy and digital learning leadership
Principal public junior high school 2 Gedeg	-	10+ years	School policy and digital learning leadership
Vice Principal public junior high school 1 Bangsal	-	8-12 years	Curriculum and Infrastructure integration of digital learning
Vice Principal public junior high school 2 Gedeg	-	8-12 years	Curriculum and Infrastructure integration of digital learning
Teacher	Sciences	5+ years	Online resource and digital learning
Teacher	Mathematics	5+ years	Online resource and digital learning
Teacher	Sciences	5+ years	Online resource and digital learning
Teacher	Mathematics	5+ years	Online resource and digital learning

Field data was collected from March to May 2024 at public junior high school 1 Bangsal and public junior high school 2 Gedeg. The data collection process was carried out in stages, starting with interviews, followed by classroom observations, and ending with the collection of supporting documents from each school.

Data Analysis

Data analysis is carried out interactively using the Miles, Huberman, and Saldaña model, which includes three stages: (1) Data Reduction. The researcher selects, focuses, and groups relevant data. (2) Data Display. The reduced data is presented in the form of narratives and tables, making interpretation easier. (3) Conclusion, Drawing, and Verification. The final stage involves identifying relational patterns among findings (Miles & Huberman, 2014). These results are obtained through technique triangulation.

RESULTS AND DISCUSSION

Results

Implementing Digital Technology in Learning at Public Junior High school 1 Bangsal

Researchers found that the quality of learning at public junior high school 1 Bangsal is considered good because the school implements various effective procedures, methods, and learning techniques. Some of the methods used include: 1.) Active Learning Approach. Public junior high school 1 Bangsal Mojokerto applies project-based learning

that allows students to apply their knowledge in real life. This approach aims to increase student engagement and provide a more meaningful learning experience; 2.) Collaborative Learning. Learning takes place using a cooperative approach, where students work in groups to complete tasks or solve problems. This approach helps develop teamwork and communication skills that are highly needed in the future workplace; 3.) Differentiated Learning. This learning method adjusts the teaching methods to each student's abilities and learning styles. This is important to ensure each student can learn at their own pace and according to their characteristics so that learning outcomes can be optimised.

In terms of Technology Utilisation, public junior high school 1 Bangsal uses technology as a learning tool. Teachers are trained to use digital platforms, e-learning, and social media to enrich learning materials and give students the chance to learn more interactively.

Use of Technology at Public Junior High School 1 Bangsal

Research results show that the use of technology at public junior high school 1 Bangsal is still limited to digital whiteboards and projectors. Besides that, internet access is still a challenge in carrying out technology-based learning.

Table 2. Use of Technology in Public Junior High School 1 Bangsal.

Technology Used	Usage Percentage	Main Obstacles Faced
Digital whiteboard	70%	Limitations of adequate devices
Projector	85%	Technical problems often occur
Internet access for learning	50%	Internet access is unstable and limited

Evaluation of Learning at Public Junior High School 1 Bangsal

Learning evaluation showed an improvement in student learning outcomes in subjects taught using a technology-based approach. The following is data on improving student learning results:

Table 3. Evaluation on Learning in Public Junior High School 1 Bangsal.

Subjects	Average before Technology Used	Average after Technology Used	Increase
Mathematics	65	80	15%
Indonesian	70	88	18%
Sciences	60	72	12%

Implementing Digital Technology in Learning at Public Junior High School 2 Gedeg

Curriculum Planning and Development School

Leaders create a strategic plan that includes developing a curriculum relevant to students' needs and current times. This process involves collaboration between teachers and education staff to ensure the curriculum implemented can improve the quality of learning.

Enhancing Teacher Competence

Teacher competence is improved through training, workshops, and seminars. Effective school leadership encourages teachers to keep developing themselves so that the learning process becomes more innovative and effective.

Strengthening Supervision and Evaluation

Supervision and evaluation of learning are carried out regularly. The headteacher observes classes, gives constructive feedback to teachers, and evaluates student learning outcomes to determine the effectiveness of the applied teaching methods.

Efficient Resource Management

Management of human resources and facilities is done efficiently. The headteacher ensures that the available facilities can support the learning process while motivating educators to work optimally.

Utilisation of Technology in Learning

Integrating technology into learning can increase student engagement and make access to information easier. The headteacher encourages the appropriate use of technology, such as online learning platforms and educational applications, to support the teaching and learning process.

Use of Technology at Public Junior High School 2 Gedeg

Public junior high school 2 Gedeg has been using digital technology through Google Classroom and Zoom for online learning.

Table 4. Use of Technology in Public Junior High School 2 Gedeg.

Types of Technology Used	Usage Percentage	Main Obstacles Faced
Google Classroom	70%	Internet access is limited among students, causing some students to have difficulty following the material
Zoom	60%	Limited data quotas and unstable internet connections hinder students active participation in online learning sessions

Learning Evaluation at Public Junior High School 2 Gedeg

Learning evaluation showed an improvement in student learning outcomes in subjects taught using a technology-based approach. The following is data on improving student learning results:

Table 5. Evaluation on Learning in Public Junior High School 2 Gedeg.

Subjects	Average before Technology Used	Average after Technology Used	Increase
Mathematics	60	72	12%
Indonesian	70	84	14%
Sciences	60	75	15%

Discussion

Forms and Strategies for Using Digital Technology in Learning

Research findings show that public junior high school 1 Bangsal and public junior high school 2 Gedeg have both been using digital technology in learning, but in different ways. At public junior high school 1 Bangsal, the use of digital technology is more integrated with classroom learning strategies, including project-based learning, collaborative learning, differentiated learning, and using digital platforms as supporting learning media. Technology is used to support students' learning activities.

In contrast, at public junior high school 2 Gedeg, the use of digital technology is not just seen in the use of Google Classroom and Zoom, but also forms part of the school's wider strategy. Findings show that technology implementation is supported through curriculum development, teacher competence improvement, learning supervision, resource management, collaboration with stakeholders, and regular programme evaluation. Thus, the use of digital technology at public junior high school 2 Gedeg seems more connected to school management aspects compared to public junior high school 1 Bangsal, which focuses more on in-class learning practices.

The difference shows that the implementation of digital technology doesn't develop along the same path. At public junior high school 1 Bangsal, the use of technology seems to grow from classroom learning needs, so technology integration is more visible in teaching strategies applied by teachers. In contrast, at public junior high school 2 Gedeg, digital technology develops through structured organisational support, like curriculum development, learning supervision, and program evaluation. Organisational factors play a role in determining how technology is adopted in schools (Amar & Eleyan, 2022; Zheng et al., 2023). When technology use is backed by policy and resource management, its implementation tends to be more than just classroom practice for teachers but part of a digitalised school system.

These differences show that the implementation of digital technology in both schools develops according to each school's needs and priorities. This finding aligns with Motz et al., (2023) and Saidu et al., (2024), who stated that using digital technology in education is not just about using tech devices, but also influenced by the acclimatisation process and developing a supportive academic environment.

The implementation of digital technology is contextual and influenced by the school's organisational structure. The difference between public junior high school 1 Bangsal, which is dominant at the classroom pedagogical practice level, and public junior high school 2 Gedeg, which is stronger at the school management level, indicates variation in the integration of TPACK at the intersection of technological knowledge and institutional support for teacher competence development. The emerging synthesis is how far schools can align technology with pedagogical strategies and learning management at the same time.

Challenges of Implementing Digital Technology in Learning

Even though digital technology has been used in both schools, the research found that its implementation still faces several obstacles. At public junior high school 1 Bangsal, the main challenges were limited learning support devices, technical issues with using the projector, and unstable internet access. This shows that the use of digital technology is still influenced by the availability of infrastructure that supports the learning process (Flowers & Tanner, 2024; Morales et al., 2020; Supardi et al., 2024).

Meanwhile, at public junior high school 2 Gedeg, the issues that came up were mostly about students' access to digital learning. Using Google Classroom and Zoom ran into problems like limited internet data and sometimes unstable connections. As a result, not all students could take part in digital learning at the same time effectively. The differences in challenges that arise show varied barriers to implementing digital technology. As technology integration in school systems increases, the focus of challenges may shift from just providing facilities to ensuring equal access and student participation, which should align with the use of existing technology. One key point stressed is that students' ability to access and make good use of this technology is the initial foundation for achieving learning outcomes.

The challenges that arise reflect an imbalance between technology, pedagogy, and content in learning practices. Limited infrastructure and internet access at both schools affect the optimal use of technological knowledge in supporting learning design. As a result, the integration of technology and pedagogy cannot happen consistently, so the use of technology is still situational, depending on device readiness and student conditions.

Another interesting finding is that the use of digital technology isn't applied evenly across all subjects. From what we observed, technology is used more in lessons that need visual material, information searches, or collaborative activities. Meanwhile, for certain topics, teachers still stick to traditional teaching methods because they think they're better suited to the learning goals. This shows that decisions about using technology in teaching aren't just about what's available, but also about teachers' pedagogical considerations regarding the material and the students' needs (Burke et al., 2018; Collins, 2024; Mittal et al., 2025).

There is a difference with Galaraga & Alpuerto, (2022) findings, which tend to emphasise the digitalisation of learning by talking about the readiness of technology and the relevant teachers' competencies in the Philippines. This study's findings focus on the issues of implementing digital technology, which cannot yet be reduced to that level. In the context of both schools, it appears that technological barriers actually arise as a result of the interaction between limited infrastructure, fragmented pedagogical practices, and the unstable integration of TPACK at the school level. This indicates a mismatch between the top-down digitalisation agenda.

Furthermore, if Sasikumar et al., (2023) research suggests that increased access to technology will directly improve the quality of learning in India, this study goes further in expanding that assumption. Without consistent pedagogical integration supported by institutions, technology tends to just boost the intensity of learning activities, not the quality of learning itself.

The Impact of Using Digital Technology in Learning

Research findings show changes in the learning process after the use of digital technology was implemented in both schools. At public junior high school 1 Bangsal, the use of digital technology is combined with project-based learning, collaborative learning, and differentiated learning, giving students more opportunities to engage in learning activities. On the other hand, at public junior high school 2 Gedeg, the use of digital technology is supported by various school strategies aimed at strengthening the implementation of learning.

The evaluation data the schools have show that there was an increase in grades in several subjects after using a technology-based approach. At public junior high school 1

Bangsals, the grade improvement ranged from 12% to 18%, while at public junior high school 2 Gedeg it ranged from 12% to 15%. However, these findings need to be understood carefully because this study wasn't designed to test a cause-and-effect relationship between digital technology use and student learning outcomes. The data just shows that the grade increase happened during the same period when the schools started integrating digital technology into learning.

The improvements found tend to be associated with changes in the learning process that come with them. At public junior high school 1 Bangsal, technology is used to support project-based, collaborative, and differentiated learning, giving students more opportunities to get actively involved. Meanwhile, at public junior high school 2 Gedeg, the impact of technology use is supported by various organisational mechanisms that strengthen the consistency of digital learning implementation. This shows that learning technology contributes more and has the potential to create a multiplier effect when integrated with pedagogical strategies and the school organisation. Technology cannot stand alone.

From the TPACK framework perspective, the impact at both schools appears when there is alignment between the technology used, pedagogical strategies and content characteristics. When technology is only used as a tool without integration with pedagogy and content, the effect is mostly limited to increased learning activity. On the other hand, when technology is integrated into a learning design that considers teaching strategies, its contribution to the learning process becomes much more noticeable (Al Doghan & Sadiq, 2025; Luo et al., 2024).

Apart from being related to learning outcomes, research also found that digital technology broadens students' access to learning resources and offers more varied learning media compared to just using conventional resources (Ilin, 2022; Littlejohn et al., 2008; Rizvi et al., 2025). This finding supports studies by Cronin, (2024) and Gierhart, (2024) which showed that digital technology can enrich students' learning experiences and support a more flexible learning process. However, these benefits still depend on how the technology is used in learning and how well schools can overcome the challenges of implementation.

CONCLUSION

Fundamental Finding: The implementation of digital technology develops according to the context of each school with the aim of improving learning outcomes. At public junior high school 1 Bangsal, technology integration is more evident in pedagogical strategies. Meanwhile, at public junior high school 2 Gedeg, technology is implemented at the school organisational level, including curriculum development and program evaluation mechanisms. Digital technology doesn't act as the sole factor determining learning quality but as part of the school ecosystem. **Implication:** Efforts to digitise learning need to focus on aligning technological tools (LMS, projectors, synchronous/asynchronous platforms) with instructional strategy design and content sequencing for each subject. The school system should act as an enabling structure by standardising the evaluation of technology use and learning results. **Limitation:** The research was only conducted in two public middle schools, so the findings can't be generalised to schools with different characteristics. Also, the study focused on the use of digital technology and didn't measure its impact on student learning outcomes empirically. The research data was mostly from the perspectives of principals and teachers, so the findings are heavily influenced by each school's context. **Future Research:** A mixed-method design is needed

to provide a more comprehensive understanding. Longitudinal studies allow researchers to observe changes in the implementation of digital technology as schools' digital capacities develop over time. In addition, future research needs to involve students' perspectives to understand how digital technology is experienced by learners and its impact on engagement and participation in learning. The next studies can also examine the relationship between digital readiness, teacher competence, learning quality and learning outcomes.

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