



Science learning management based on information technology in the context of school curriculum implementation

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Abstract. This study aims to describe the management of science learning based on information technology at State Junior High School 1 Bengkulu Selatan. The research employed a qualitative descriptive method with purposive selection of subjects, including science teachers, the principal, the vice principals for curriculum and facilities, and students. Research data were obtained through interviews, observations, and documentation, then analysed through data reduction, presentation, verification, and conclusion drawing. The urgency of this study lies in the demand for adaptive learning management in the digital era. At the same time, many schools still face infrastructure limitations, low digital literacy, and inadequate human resources. The subjects were chosen purposively because of their direct involvement in the planning and implementation of science learning, ensuring diverse perspectives and comprehensive findings. The results showed that the management of science learning based on information technology at State Junior High School 1 Bengkulu Selatan has

been applied gradually in line with curriculum demands. The school demonstrated a commitment to integrating technology into planning, implementation, and evaluation, although several challenges remain, particularly related to facilities, teacher competencies, and policy support. Various strategies and collaborations have been pursued to create a more inclusive and contextually relevant learning ecosystem. This study recommends further research to develop sustainable and scalable models of technology-based learning management and to evaluate the effectiveness of digital infrastructure policies at the junior high school level.

Introduction

The development of information and communication technology in the digital era has transformed various aspects of life, including the field of education (Widana & Ratnaya, 2021). The integration of technology into the learning process has become an urgent necessity in line with the progress of the times. One of the primary challenges for education in Indonesia is effectively integrating technology into the teaching and learning process, particularly in science education. Science learning requires an approach that enables students to understand scientific concepts more deeply, critically, and creatively, while also developing digital literacy skills relevant to the demands of the 21st century. Technology has brought fundamental changes to the educational process, from broader access to information to the use of digital tools that facilitate learning management. Digital technology enables more interactive and adaptive teaching, enhances student engagement, and

supports learner-centred education (Wati & Nurhasannah, 2024). In the Indonesian context, the government, through the Ministry of Education and Culture, has promoted the integration of technology in education through various programs, including the use of online learning platforms during the COVID-19 pandemic. Digital literacy, defined as the ability to effectively use technology to search for, evaluate, and communicate information, has become an essential competency that both students and teachers must possess today (Endrawati et al., 2022). However, the implementation of technology in education is not only related to the provision of digital infrastructure, but also to the ability to manage learning effectively. Learning management encompasses various aspects, including planning, implementation, and evaluation of the learning process. Teachers must be able to manage available resources, both technological and non-technological, to create a conducive and meaningful learning environment for students. Research indicates that the effectiveness of technology use in education is significantly influenced by how teachers manage and facilitate its use in learning activities (Purba & Saragih, 2023).

Despite the growing discourse on digital learning, a research gap remains in understanding how information technology is managed explicitly in science learning at the junior high school level. Previous studies have primarily focused on elementary schools, specific applications, or blended learning in senior high schools; however, there is still limited attention to the contextual challenges of managing technology-based science learning in public junior high schools in developing regions (Purnadewi & Widana, 2023).

State Junior High School 1 Bengkulu Selatan is one of the schools that has started implementing the Independent Curriculum since its launch by the government, and is currently in the process of developing the curriculum with adjustments to government policies. As in many schools in Indonesia, the challenges of integrating technology and digital literacy into science learning remain significant. The main challenges faced are inadequate technological infrastructure, unequal digital skills among teachers, and minimal access to relevant digital learning resources. The success of implementing any curriculum in schools is greatly influenced by the school's readiness to utilise technology and digital literacy as part of its learning strategy (Romadhan et al., 2023). Based on field observations, science teachers at SMPN 1 Bengkulu Selatan still struggle to utilise interactive learning platforms, students' digital literacy is limited, and classrooms lack adequate projectors or multimedia devices. The science laboratory is not yet integrated with digital tools for simulation-based experiments. These facts suggest that the problem is not only pedagogical but also structural, underscoring the urgency of this study.

Learning management refers to the process of planning, implementing, and evaluating classroom activities systematically (Bryant & Walker, 2024; Widana, 2020). Science education (IPA) emphasises developing scientific reasoning, problem-solving, and experimentation (Judijanto et al., 2025). Information technology is defined as digital tools and platforms that support interactive, adaptive, and learner-centred approaches (Wati & Nurhasannah, 2024). Finally, curriculum implementation highlights how schools translate national policy into contextual learning practices (Rusandi et al., 2024). This study offers novelty by combining these variables in the context of SMPN 1 Bengkulu Selatan, where the research not only identifies gaps in infrastructure and pedagogy but also explores strategies for adaptive management of technology-based science learning.

Based on the background and the identified research gap, this study seeks to explore several key questions related to the management of information technology-based science learning at State Junior High School 1 Bengkulu Selatan. First, it examines how the planning of science learning based on information technology is carried out, particularly in relation to preparing lesson plans, creating learning media, and aligning digital resources with curriculum objectives. Second, it

examines the implementation of information technology-based science learning, focusing on teaching strategies, classroom practices, and the integration of digital tools to facilitate interactive and student-centred learning. Third, this study evaluates information technology-based science learning, which involves assessing student learning outcomes, monitoring the effectiveness of digital tools, and measuring the alignment between planned objectives and actual classroom practices. Fourth, it analyses the obstacles encountered in the process of technology-based science learning, including issues related to infrastructure, teacher competence, student digital literacy, and institutional support. Ultimately, this research examines the solutions implemented by the school, teachers, and stakeholders to overcome these challenges, to develop more adaptable, innovative, and sustainable models of science learning management in the digital era.

Method

Type and Research Design

This study employs a qualitative descriptive approach, chosen because it enables researchers to understand the reality in the field from the perspective of the research subjects and explore the context and complexity that exist in the implementation of learning in schools. A qualitative descriptive approach is a research method that aims to provide a systematic, factual, and accurate picture of the phenomenon being studied. In this study, a qualitative approach was used to study how school management, teachers, and students at State Junior High School 1 South Bengkulu manage technology-based science learning. The research design used was a case study. A case study is one of the designs in qualitative research that allows researchers to explore certain phenomena in a real-life context (Sugiyono, 2022).

Participant Technique

In this study, a case study was employed to examine in detail and in depth the management of information technology-based science learning at State Junior High School 1 South Bengkulu. The subjects of this study included science teachers, students, science laboratory coordinators, principals, vice principals for curriculum and vice principals for facilities and infrastructure at State Junior High School 1 South Bengkulu.

Research Procedure

The research procedure followed the stages of a qualitative case study, starting with identifying the research focus, determining participants, conducting field data collection, analyzing the data, and drawing conclusions. The overall research procedure is illustrated in the Research Procedure Diagram (Image 1).

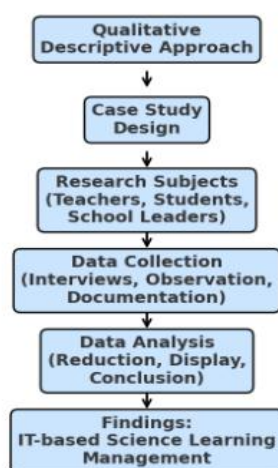


Image 1. Research procedure diagram

Data Collection Instruments and Validation Techniques

In qualitative research, various data collection techniques are used to gain a comprehensive understanding of the phenomenon being studied. The data collection techniques that will be used in this study are: (1) Interviews; (2) Observation; and (3) Documentation. Documents analysed included lesson plans, teaching materials, and internal school policies related to curriculum implementation. To ensure the validity of the data, the researcher applied triangulation by comparing information obtained from different techniques and participants.

Data Analysis Techniques and Criteria

Data analysis was conducted through four stages: data reduction, data display, verification, and conclusion. The following is a description of the data analysis technique used in this study, as illustrated in the chart below.

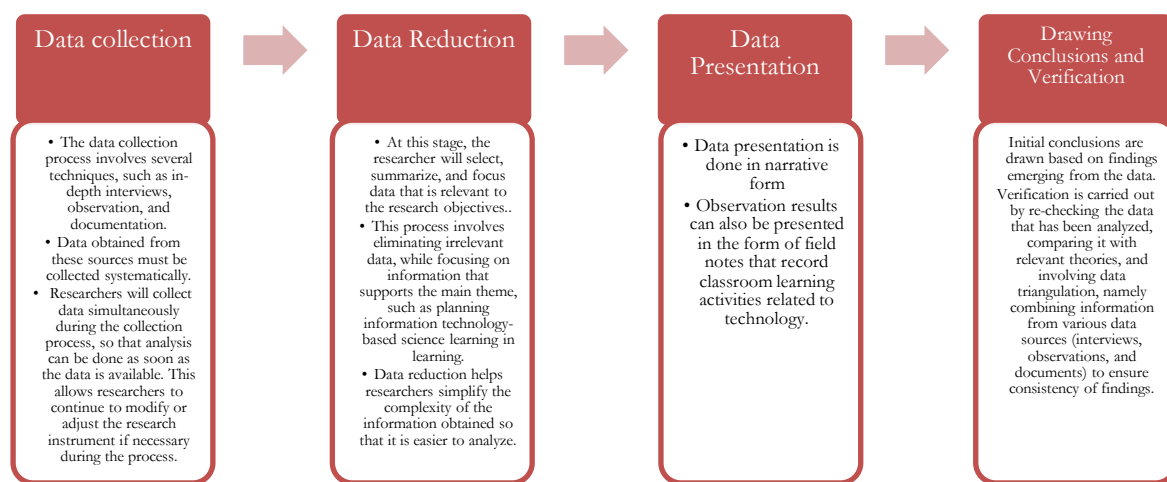


Image 2. Data Analysis Techniques

Results and Discussion

The results of this research and discussion are focused by the researcher according to the formulation of the problem that has been set, so that it is described in five main aspects, namely: (1) Planning of science learning based on information technology; (2) Implementation of science learning based on information technology; (3) Evaluation of science learning based on information technology; (4) Obstacles faced in science learning based on information technology; and (5) Solutions taken in facing obstacles in science learning based on information technology (Image 3).

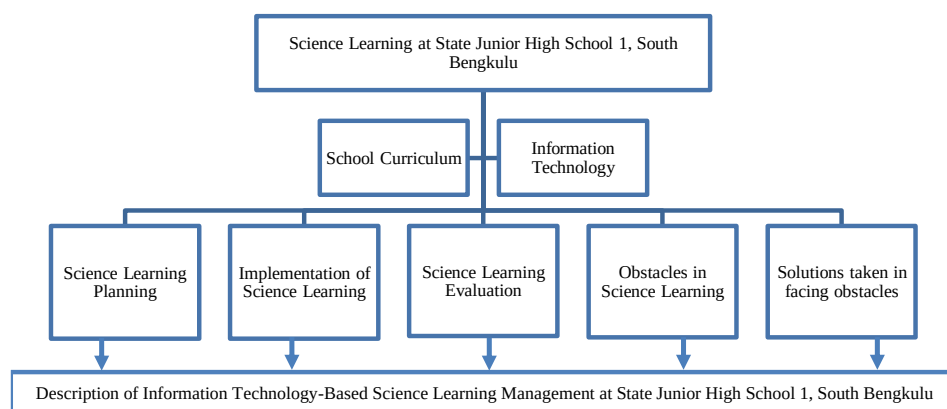


Image 3. Research Focus and Paradigm

Interviews with science teachers, the principal, the vice principal for curriculum, and the vice principal for facilities and infrastructure showed that the planning of information technology-based science learning at SMP Negeri 1 Bengkulu Selatan has been implemented in stages, with the support of school leaders, teacher initiative, and the use of various digital platforms. Although there are still limitations in facilities and time, the integration of technology in planning has become a new culture that is evolving and aligns with the demands of the current curriculum. The implementation of information technology-based science learning at State Junior High School 1 South Bengkulu has been going quite well. Teachers utilise various digital devices and media to support a more engaging, interactive, and contextual learning process. Collaboration, reflection, and innovation in learning strategies demonstrate a continuous effort to enhance the quality of science learning, aligning with the spirit of the curriculum and the demands of the digital era. In terms of science teacher competency, teachers are relatively active in utilising various technological media, such as presentation slides, learning videos, and digital simulations, to deliver material. However, in terms of teacher innovation and response to technical challenges, although teachers have basic awareness and skills in using technology, the development of interactive methods is still suboptimal, and their ability to overcome technical obstacles is not yet fully independent. Student engagement shows quite positive results, indicating that students are enthusiastic about using digital devices in science learning.

Table 1. Results of Observations on Science Learning Management

Observed Aspects (Indicators)	Sub Indicators	Observation Points	Score	Description
Information technology infrastructure and facilities	Availability of information technology-based learning devices	Projectors/interactive TVs, and laptops are available in science classes.	2	Limited
	Internet connection	Internet connection is available and can be accessed smoothly by teachers/students	3	Good Enough
	Arrangement of information technology facilities	Information technology devices are well arranged and organised in the science classroom/laboratory.	2	Limited
Science Teacher Competence	Use of digital media in the teaching and learning process	Teachers utilise information technology-based media (such as slides, videos, and simulations) in their teaching and learning.	3	Good Enough
	Learning innovation using information technology	Teachers develop technology-based interactive methods	2	Limited
	Responsiveness to technical issues	Teachers can overcome minor technical difficulties during the learning process.	2	Limited
Student Involvement in Information Technology	Active student participation	Students are enthusiastic about using information technology devices in science learning	3	Good Enough
	Student digital collaboration	Students work together on assignments using digital platforms/information technology.	2	Limited
	Discipline in the use of technology	Students use information technology according to directions and do not misuse it.	2	Limited

Observed Aspects (Indicators)	Sub Indicators	Observation Points	Score	Description
Curriculum Integration with Technology	Learning according to teaching modules/RPP based on information technology	Teachers refer to lesson plans/teaching modules that include the use of information technology.	2	Limited
	Integration of information technology in science learning objectives	Learning objectives reflect the application of information technology	2	Limited
	Information technology-based assessment	Assessment/collection of assignments is done via digital platforms (E.g., Google Forms).	2	Limited

Observations indicate that the implementation of information technology-based science learning at State Junior High School 1 South Bengkulu is at a developing stage, with most indicators categorised as limitedly implemented and only a few aspects showing satisfactory results.

Planning of Science Learning Based on Information Technology

The use of information technology in science learning planning at State Junior High School 1, Bengkulu Selatan, demonstrates a significant paradigm shift in the world of education, particularly in responding to the challenges and opportunities presented by implementing the current curriculum. Planning is no longer done conventionally, but has adopted a structured digital approach and integrated it into an adaptive and contextual learning strategy. Support from the school is the main determining factor. The Principal emphasised that technology is not only a teaching aid, but has become an essential instrument in the learning planning process. This indicates that the school's managerial policy has been designed to encourage digital transformation in a holistic manner. Visionary school leadership in the development of information technology can accelerate changes in a technology-based learning culture (Hasna, 2024). The integration of information technology is evident in how teachers formulate learning objectives that explicitly encourage the development of students' digital literacy, such as the skills of searching for and evaluating scientific information through online media. The Vice Principal for Curriculum emphasised that learning achievement indicators are now designed so that students not only understand science content but also have applicable digital skills, such as compiling reports through presentation applications and using digital platforms as learning resources. This aligns with the TPACK (Technological Pedagogical Content Knowledge) approach, which emphasises the need to combine pedagogical, content, and technological elements simultaneously (Ratri, 2021). Science teachers at this school actively use various digital platforms in the planning process.

In terms of infrastructure, the school continues to make improvements. Although not all facilities are optimally available, the school has made efforts to add devices and improve the internet network. This process demonstrates the institution's commitment to developing digital learning, highlighting that establishing an information technology-based learning environment necessitates a long-term investment in infrastructure, training, and technical support (Putri et al., 2025). However, challenges remain. Teachers reported that technical constraints, such as unstable internet connections, limited device availability, and insufficient time to learn new applications, were still obstacles. Science teachers stated that creating interactive media required additional time and technical skills that were not evenly distributed among all teachers. Key barriers to integrating information technology into education in developing countries include a lack of training, access to devices, and ongoing technical support (Susanto & Hermina, 2024). However, what is interesting is that the momentum of the COVID-19 pandemic has become a turning point that accelerates the

adoption of technology. Teachers admit that the experience of online learning has encouraged them to become more familiar and confident in using various digital platforms, which are now also applied in the face-to-face learning phase. This transformation demonstrates that the changes triggered by the crisis can be an opportunity to establish a new culture based on more modern and flexible learning practices (Kusnanto et al., 2024). The training attended by teachers and the Education Office strengthens the competence of science teachers in planning technology-based learning. For example, Google Workspace and interactive media training have increased teachers' insight into utilising technology as an integral part of planning. Continuous professional development is crucial for enhancing the quality of information technology integration by teachers in the learning process (Wati & Nurhasannah, 2024).

Learning planning is an important foundation in an effective teaching and learning process. In the context of the 21st century and the digital transformation of education, effective science learning planning must be able to integrate information technology meaningfully and sustainably in all aspects of learning, from objectives and materials to methods, media, and evaluation. Ideal information technology-based science learning plans not only target academic competency achievements but also develop students' digital competencies, such as information literacy, critical thinking, and communication skills, through digital platforms. Digital skills are an important part of the global competency framework that must be internalised since elementary and secondary education (Lestyaningrum et al., 2022). Science teachers need to prepare lesson plans or teaching modules by adopting the TPACK (Technological Pedagogical Content Knowledge) approach, which combines understanding of lesson content, pedagogical strategies, and the utilisation of technology. This approach allows teachers to design learning activities that not only transfer content into digital form, but also change the way students learn science to be more interactive, collaborative, and contextual (Mishra et al., 2022). Science learning planning must include the selection of digital learning media that are appropriate to the characteristics of the material. Technology-based learning planning must consider accessibility and student readiness for devices and networks, especially in areas where digital infrastructure is not evenly distributed. Therefore, teachers need to prepare alternative plans in the form of blended learning or the use of offline media, such as videos or interactive modules, that can be accessed without an internet connection. (Ahmad et al., 2021). The ideal planning for information technology-based science learning involves comprehensive, contextual, and 21st-century skills-oriented planning.

Implementation of Information Technology-Based Science Learning

In practice, the integration of hardware and software is the main foundation for creating a more meaningful, participatory, and contextual learning experience for students. Data shows that science teachers at the school have adopted a learning approach that combines technology functionally and innovatively. Teachers not only present materials visually, but also strive to create a space for active participation with digital quizzes, collaborative projects, and field observations reported in digital form. This strategy represents a paradigm shift from conventional learning to technology-based learning, emphasising active student involvement, conceptual understanding through visualisation, and strengthening digital skills. Support for facilities from the school and cross-field collaboration are also important drivers in the implementation of this learning model. Theoretically, this approach aligns with the concept of Technological Pedagogical Content Knowledge (TPACK), which emphasises the importance of synergy between content, pedagogy, and technology in developing effective learning (Mishra et al., 2022; Widana et al., 2021). Teachers at State Junior High School 1 South Bengkulu demonstrated their ability to adapt technology to the characteristics of science materials, for example, using 3D animation to explain biological processes or experimental videos for science phenomena. This reflects a good pedagogical understanding of how technology can mediate understanding of abstract concepts. Furthermore, the use of technology in science learning reinforces the principle of constructivist learning, where students

build their understanding through active interaction with materials, technology, and peers. Project-based learning facilitated by technology like this aligns with efforts to build 21st-century competencies, particularly in aspects such as collaboration, creativity, and digital literacy (Abdurahman, 2024). This is important, considering the need for students not only to understand science content but also to apply it in real-life contexts with the support of technology. However, challenges remain, such as limited facilities in some classes and the need to improve technology competency for teachers as a whole. The success of ICT-based learning is greatly influenced by the readiness of infrastructure, teacher training, and support from school management (Ahmad et al., 2021).

Evaluation of Information Technology-Based Science Learning

The evaluation process not only focuses on cognitive aspects, but also measures digital skills, creativity, and active participation of students in the use of technology media. The forms of evaluation applied include digital quizzes, multimedia projects, observations of students' digital activities, and independent reflection and peer assessment. This evaluation is conducted both formatively and summatively, utilising digital platforms such as Google Forms, Quizizz, Canva, and Google Classroom. These evaluative activities are complemented by digital documentation, facilitating the tracking of student achievement and continuous pedagogical decision-making. The use of digital quizzes and multimedia projects demonstrates the application of authentic assessment, which is designed to reflect real-world challenges and assess essential skills such as problem solving, collaboration, and digital literacy (Fitria et al., 2024).

Evaluation is carried out not only to measure learning success, but also as a diagnostic and reflective tool to improve the quality of learning. In the context of independent curriculum and differentiated learning, this approach is relevant because it provides students with space to demonstrate their achievements through various media, tailored to their interests and learning styles. Practices such as digital project assessment, observation of simulation use, and student reflection reflect a holistic approach that integrates cognitive, affective, and psychomotor assessments. Student involvement in self-assessment and group evaluation reflects the assessment as a learning approach, where students actively build metacognitive awareness of their learning process (Supuwingsih, 2025). Although these evaluation practices are quite advanced, challenges remain in terms of equalising the use of technology across classes, the reliability of internet connections, and the need for further training for teachers to deepen their digital data analysis skills. However, the existence of reflection between teachers through subject teacher discussion activities and internal supervision indicates the existence of a learning organisation culture that allows for collective and sustainable capacity building (Saptorini et al., 2024).

Obstacles in Information Technology-Based Science Learning

The implementation of information technology-based science learning at State Junior High School 1, Bengkulu Selatan, has experienced positive developments. However, several obstacles affect its effectiveness. These obstacles include limited infrastructure, such as uneven distribution of ICT devices, unstable internet connections, and the absence of special technical personnel for device maintenance. In addition, the lack of intensive and sustainable teacher training, the unpreparedness of some students to access technology, technical obstacles during learning, as well as time constraints and a lack of explicit curriculum direction regarding technology integration, are the main challenges. Other obstacles include low collaboration between teachers and varying administrative burdens, as well as student motivation. Nevertheless, the enthusiasm of teachers to continue adapting and learning in the development of technology-based learning remains strong. These obstacles in IT-based science learning reflect the complexity of digital transformation in education, especially in secondary schools that face limited resources. In terms of infrastructure, limited devices and unstable internet connections are systemic problems that are common in many

schools in non-urban areas. Access to adequate digital infrastructure is the main foundation for integrating learning technology. Without this support, digitalisation efforts tend to be sporadic and unsustainable (Wahyunto, 2025). The absence of IT technical personnel also places an additional burden on teachers. They not only have to design and implement learning, but also act as “troubleshooters” when technical problems arise. This situation is not ideal and can reduce the effectiveness of learning and disrupt the teacher’s pedagogical focus (Castañeda & Williamson, 2021). In addition, unfocused and general training often fails to address the specific needs of science teachers. Practical ICT training should be subject-based and conducted continuously, rather than as one-off sessions (Nasir et al., 2023). Another obstacle comes from students’ digital readiness. The gap in digital literacy among students creates a gap in technology utilisation, which in the long run. When some students lack devices or are unfamiliar with digital learning platforms, teachers must allocate more time for mentoring, which ultimately reduces the time for delivering materials.

From a pedagogical aspect, time constraints are a significant barrier. The process of preparing devices, explaining the use of applications, and guiding users through technology requires a significant amount of time. In an education system that is still oriented towards curriculum achievement and limited face-to-face hours, this makes it difficult for teachers to integrate ICT consistently (Nasution, 2024). Moreover, suppose the curriculum does not provide explicit guidance on the use of technology in science learning. In that case, teachers will experience ambiguity in determining the extent to which the use of ICT is considered appropriate or excessive. Low collaboration between teachers and the lack of professional forums for sharing good practices are also equally important obstacles. In fact, the success of implementing ICT-based learning is highly dependent on the existence of an active and mutually supportive learning community (Selviani et al., 2025).

The various obstacles encountered in information technology-based science learning at State Junior High School 1 Bengkulu Selatan demonstrate that digital transformation in education is not only about the availability of tools, but also about the readiness of systems, teachers, students, and policies. Infrastructure and technical obstacles must be addressed through school and regional-level policies that focus on equalising access to technology and providing adequate technical support. On the other hand, continuous teacher capacity development is a crucial aspect. Teachers are not only trained technically, but also need to be guided in designing meaningful, contextual science learning that utilises technology appropriately. Ideally, training is based on peer mentoring and lesson study that allows teachers to learn from each other in the real context of their learning (Rahmadani et al., 2025).

Solutions to Facing Obstacles in Information Technology-Based Science Learning

The comprehensive approach taken by State Junior High School 1 South Bengkulu to overcome technological barriers in science learning reflects a new paradigm in digital education management. Gradual improvements in infrastructure aspects, achieved through the use of internal school funds and digitalisation programs, demonstrate that policy support and public financing are crucial catalysts for the digital transformation of schools. The gradual procurement of tools tailored to the school’s capabilities underscores the importance of a sustainable and realistic strategy in addressing the disparity in facilities. Improving internet quality and providing additional Wi-Fi access points show that connectivity is not only seen as a technical means, but as a fundamental learning infrastructure in the digital era (Wibowo, 2025; Ismanto et al., 2024).

Continuous teacher training efforts and informal mentoring approaches between teachers indicate the importance of professional learning communities in schools. Teacher learning communities can accelerate the adoption of information technology-based pedagogical innovations because the

approach is contextual, relevant, and practical (Rodhiyana, 2025). Similarly, training of grade VII students on the use of learning applications shows a transition from passive learning to active and directed digital learning. The integration of technology into the learning implementation plan and learning supervision shows that schools have begun to internalise the technological approach not as a complement, but as part of the pedagogical design. This aligns with the concept of Technological Pedagogical Content Knowledge (TPACK), which emphasises that teachers must be able to integrate technological knowledge into the substance of the material and teaching strategies (Mishra et al., 2022; Adawiah et al., 2024).

Barriers to information technology-based science learning cannot be overcome solely with technical solutions but require a systemic and adaptive approach involving all educational stakeholders. SMP Negeri 1 Bengkulu Selatan demonstrates that, despite its complex challenges, solutions can be developed incrementally through synergy between internal resources, external support, and proactive school leadership. The information technology procurement policy, based on local needs and capabilities, demonstrates that digitalisation does not require waiting for ideal conditions; instead, it can begin with small steps that can have a significant impact if implemented consistently. Furthermore, the importance of continuous and applicable teacher training is central to the success of digital transformation.

The findings of this study reinforce and expand on prior research that highlights the importance of digital transformation in science education. Previous studies (Bhardwaj et al., 2025; Dongxue & Nagappan, 2024; Kerimbayev et al., 2023; Naimanova et al., 2023; Wijaya et al., 2025) have consistently shown that technology integration improves student engagement, develops digital literacy, and promotes student-centred learning. In line with these studies, this research demonstrates that science learning at State Junior High School 1 Bengkulu Selatan has gradually shifted from a conventional planning and delivery approach toward an adaptive and technology-oriented one. However, unlike studies conducted in well-resourced contexts, this research highlights how schools with limited infrastructure and uneven teacher competencies can still foster meaningful technology-based practices by relying on visionary leadership, local innovations, and strong professional learning communities.

From a theoretical perspective, the results contribute to strengthening the TPACK framework by providing concrete evidence of how technological, pedagogical, and content knowledge can be harmonised within a resource-limited environment. Theoretically, this study demonstrates that digital integration in science learning planning, implementation, and evaluation involves more than simply transferring traditional methods to digital platforms; it requires rethinking pedagogy to fit contextual realities. Practically, the research provides insights for school leaders, teachers, and policymakers on strategies for initiating and sustaining digital transformation in schools with uneven infrastructure through gradual investment, professional mentoring, and systemic support. The unique contribution of this study lies in documenting the resilience and adaptive strategies of teachers and schools in a developing-country context. Unlike many previous studies that emphasise technology adoption in urban or well-equipped schools, this research captures the nuanced experiences of teachers and students in overcoming systemic obstacles while still achieving meaningful technology-based science learning. This offers a new perspective on how digital transformation can be realistically pursued in secondary schools located in non-urban regions.

Nevertheless, the study has certain limitations. The findings are based on a single school case, which limits the generalizability of results to broader contexts. The data also primarily reflect the perspectives of teachers and administrators, while the voices of students, although included, were not explored as deeply. Additionally, the study is descriptive in nature and does not measure long-term learning outcomes quantitatively. Future research could address these limitations by applying

mixed-methods approaches, including multiple schools across different regions, and analysing student achievement data over time.

Conclusion

The management of information technology-based science learning at State Junior High School 1 Bengkulu Selatan has been carried out systematically through the stages of planning, implementation, evaluation, identification of obstacles, and formulation of solutions. In terms of planning, teachers and school leaders have integrated digital tools into lesson design to foster both scientific understanding and digital literacy. The implementation process incorporates the use of interactive platforms, project-based activities, and collaborative learning, all of which support the development of 21st-century competencies. Evaluation practices have also shifted toward authentic and technology-based assessments that measure not only cognitive mastery but also creativity, participation, and digital skills. Despite facing obstacles such as limited infrastructure, uneven teacher competence, and unstable internet access, the school demonstrates resilience through adaptive strategies. Collaborative solutions involving school leadership, teachers, students, and external partners show a strong commitment to building an inclusive, contextual, and sustainable digital learning ecosystem. Overall, this study confirms that the integration of information technology in science learning management contributes significantly to strengthening digital transformation in secondary education, while also highlighting the importance of continuous improvement in infrastructure, teacher competence, and institutional support.

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