



Implementation of ICT learning at SDN Pancasila Lembang

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ABSTRACT

The rapid development of Information and Communication Technology (ICT) requires the education sector to adapt, particularly in the implementation of learning in elementary schools. This study aims to describe the implementation of ICT learning at SDN Pancasila, focusing on curriculum implementation, teacher competence, instructional delivery, and available facilities and infrastructure. This study employs a qualitative approach, using observation methods and semi-structured interviews with ICT teachers. The study's results indicate that the implementation of the Kurikulum Merdeka provides schools with the flexibility to determine ICT learning materials and methods in accordance with students' needs. Teachers have basic competencies in using ICT but are not yet fully effective in integrating digital-based learning. The implementation of ICT learning went quite well, even though they still faced limited facilities such as computers and laptops. Students showed a strong interest in ICT-based learning because it was perceived as more engaging and interactive. Improvement of teacher competence and equal distribution of ICT facilities are needed to support the implementation of more effective, efficient, and equitable learning in elementary schools, especially at SDN Pancasila Lembang.

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ABSTRAK

Perkembangan Teknologi Informasi dan Komunikasi (TIK) yang pesat menuntut dunia pendidikan untuk turut beradaptasi, khususnya dalam pelaksanaan pembelajaran di sekolah dasar. Penelitian ini bertujuan untuk mendeskripsikan implementasi pembelajaran TIK di SDN Pancasila ditinjau dari aspek penerapan kurikulum, kompetensi guru, pelaksanaan pembelajaran, serta sarana dan prasarana yang tersedia. Penelitian ini menggunakan pendekatan kualitatif dengan metode observasi dan wawancara semi-terstruktur terhadap guru TIK. Hasil penelitian menunjukkan bahwa penerapan Kurikulum Merdeka memberikan keleluasaan bagi sekolah dalam menentukan materi dan metode pembelajaran TIK sesuai kebutuhan murid. Guru memiliki kompetensi dasar dalam memanfaatkan TIK, namun belum optimal dalam integrasi pembelajaran berbasis digital. Pelaksanaan pembelajaran TIK berlangsung cukup baik meskipun masih menghadapi keterbatasan fasilitas seperti komputer dan laptop. Murid menunjukkan minat yang tinggi terhadap pembelajaran berbasis TIK karena dianggap lebih menarik dan interaktif. Diperlukan peningkatan kompetensi guru dan pemerataan fasilitas TIK guna mendukung pelaksanaan pembelajaran yang lebih efektif, efisien dan merata di sekolah dasar yang utamanya di SDN Pancasila Lembang.

Kata Kunci: Kurikulum Merdeka; pembelajaran TIK; teknologi informasi dan komunikasi

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INTRODUCTION

In recent decades, technological development has experienced a significant surge, particularly since the advent of personal computers and the internet in the 1980s (Tantri, 2021). Concurrently, the world of education has begun to adapt to the concept of Education 4.0, a term used by education experts to describe the integration of cyber technology into the learning process in this digital era (Tantri, 2021). Currently, technology continues to evolve, including the arrival of the Society 5.0 era, which is characterized by increasingly rapid technological developments and increasingly complex changes in various fields, including education (Fricticarani *et al.*, 2023).

Seeing these conditions, Information and Communication Technology (ICT) has now become an inseparable part of various aspects of human life, especially in the world of education, which continues to transform to keep up with the times (Amalia, 2020). In this context, Indonesia is also currently facing challenges in the 5.0 era, where the rapid development of ICT has significantly impacted efforts to accelerate and innovate the implementation of education in the country (Darmawati *et al.*, 2023). However, behind this progress, obstacles remain in the field, one of which is teachers' competence in using ICT, which is considered suboptimal given the demands of the times (Lestari & Pratama, 2020).

Learning technology itself is an integrative and complex process, encompassing human elements, equipment, and systems involving ideas, procedures, and organizational governance. In the context of education, technological advancement is a benchmark for the development of educational institutions and the national education system. Therefore, developing a curriculum that incorporates ICT-based materials is crucial to creating a competent and literate society (Akbar *et al.*, 2023).

The rapid development of ICT today has a significant impact on education (Fauzi & Arifin, 2023). The existence of technology not only facilitates access to various information but also changes teachers' teaching methods and the way students acquire knowledge. Utilizing technology as a learning tool is the right choice to support the management of the education system. The development of ICT has a broad impact, facilitating activities and addressing various challenges in education for students, educators, and education providers (Salsabila *et al.*, 2023). Furthermore, ICT also opens up opportunities for collaboration without the constraints of space and time through various online applications. However, the implementation of ICT in educational settings still faces various obstacles, including differing levels of digital competence among educators. ICT can improve the quality and reach of education and training services when used appropriately (Fauzi & Arifin, 2023).

Learning media can be understood as part of learning resources within an integrated educational environment, delivered via a computer network system and telecommunications infrastructure (Lailiyah & Pratama, 2021). In general, ICT encompasses all aspects of technology, techniques, and management used to process, control, and utilize information (Wirany *et al.*, 2022). In the context of education, the use of ICT provides significant support for the teaching and learning process, as ICT-based media can help teachers deliver material more easily and engagingly (Munawaroh *et al.*, 2023). In the current era of Independent Learning, pedagogical competence and ICT proficiency are crucial factors influencing the quality of learning. Teachers need to continuously develop these competencies to create effective, adaptive learning in line with the demands of the Independent Learning policy (Iskanto *et al.*, 2024).

Several previous studies have highlighted the importance of ICT mastery for teachers in improving the quality of learning. For example, research shows that many teachers still lack adequate ICT competency (Lestari & Pratama, 2020). Meanwhile, the use of ICT can expand access and increase the effectiveness of the learning process (Fauzi & Arifin, 2023). However, these studies have not explicitly discussed the

combined influence of teachers' pedagogical competence and ICT skills on learning outcomes in the Merdeka Belajar era.

Based on this background, this study aims to determine the implementation of ICT subjects at Pancasila Elementary School, Lembang, and identify obstacles encountered in the learning process. The issues examined are the extent to which ICT subjects have been implemented at the school and how they support the development of students' digital competencies. Therefore, this study is expected to provide a comprehensive overview of the state of ICT learning at Pancasila Elementary School, Lembang, as a basis for improving the quality of ICT learning in the future.

LITERATURE REVIEW

Implementation and Development of Curriculum in Learning

The term curriculum comes from Latin, namely "*curriculum*"; in French, "*cuurier*" means "*to run*". The term curriculum was initially used in the world of sport with the term "*curriculum*" (Latin), namely the distance that must be covered by a runner or train in a race, from start to finish (Taufik *et al.*, 2024). The curriculum is a set of plans and arrangements for objectives, content, subject matter, and learning methods, used as guidelines for implementing education to achieve expected competencies. Education throughout its history has been anticipatory, preparing students to fulfill their roles and responsibilities in a future marked by change, thereby necessitating an educational transformation that continually adapts to current developments (Akbar *et al.*, 2023). Technological advances have also changed the way we learn, including how we use media to deliver knowledge (Khotimah, 2025). Although the curriculum is generally the same in schools and madrasas throughout Indonesia, differences in the quality of graduates are more influenced by their implementation than by their content (Fatmawati, 2021).

The Merdeka Belajar Curriculum is the latest innovation launched by the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia to provide freedom of thought and creativity for both teachers and students. (Akbar *et al.*, 2023). This curriculum shifts the learning method from primarily classroom-based to a more flexible approach, allowing learning outside the classroom and providing greater opportunities for students to engage in active discussions with teachers (Nasution *et al.*, 2023). By giving students the freedom to organize and choose learning methods that suit their interests and needs, the Independent Learning Curriculum is expected to improve the quality of learning and the relevance of education to the world of work.

Teacher Competence at Pancasila Lembang Elementary School

Competence comes from the word competency, which means the ability or skill a person possesses to perform a job or task in a particular field, as defined by the position he holds. Teacher competence is related to the nature and duties of teachers, namely, a set of knowledge, skills, and behaviors that teachers must possess, internalize, master, and actualize in carrying out their professional duties. The Law of the Republic of Indonesia Number 14 of 2005 concerning Teachers and Lecturers states that teachers must possess four types of competence: pedagogical, professional, personality, and social competence (Indrawan & Marvida, 2023). One of the important competencies that teachers must possess is pedagogical competence. Etymologically, the word pedagogy comes from the Greek "*paedos*," meaning child, and "*agoge*," meaning to guide, so pedagogy is defined as the guiding of children. A teacher must have pedagogical competence, namely the ability to design, manage, implement, and evaluate learning (Akbar, 2021). This pedagogical competence has also developed with the emergence of the term digital pedagogy, namely the effective use of technology to support, improve, and transform teaching and provide rich, diverse, and flexible learning opportunities for the digital generation (Indrawan & Marvida, 2023).

Teachers are required to develop students' potential and provide meaningful learning experiences. Therefore, as a crucial component of the learning process, teachers must possess a range of skills to improve the quality of education (Wardani & Budiadnya, 2023). Improving the quality of learning is inseparable from teachers' roles as facilitators, who can build effective learning partnerships in the classroom. Teachers also need to be discerning in selecting learning environments that actively engage students. The use of ICT is one of the significant innovations in today's education world (Indrawan & Marvida, 2023). The primary learning resources teachers have used to date have typically been textbooks in the school library. However, by using ICT, teachers can access a wider, more diverse range of learning resources. One example is using the internet to search for references or additional information for classroom learning (Lestari & Pratama, 2020).

Implementation of Information and Communication Technology (ICT) Based Learning

ICT has become a driving force of revolution in various sectors, including education (Chairy *et al.*, 2023). Educators, as the spearhead of the development of the younger generation, need to increase their professionalism and become agents of transformation in strengthening Indonesian Human Resources (HR) because the future requires a generation that can be creative and talented in facing the challenges and changes that occur in the era of globalization (Aryanti *et al.*, 2021). Research findings from interviews show that most students prefer learning that utilizes ICT, including LCD projectors to deliver material and the internet to complete assignments, because it is more modern, engaging, and less boring (Mukaromah, 2020).

The use of ICT by teachers has several important contributions, including: 1) Improving the Quality of Learning: By using ICT in learning, teachers can create a more interesting and interactive learning experience for students. Learning materials can be presented in a more varied and engaging way, thereby increasing students' interest and motivation to learn; 2) Broad Access to Education: The use of ICT can also expand access to education and teaching for all students. With online learning and digital learning resources, students can learn from anywhere and at any time, without being limited by distance and time; and 3) Preparation for the Future: In an era that is increasingly dependent on technology, skills in using ICT are essential for students (Lasut *et al.*, 2023).

METHODS

This study employs a qualitative approach to gain a deeper understanding of social phenomena and human activities in the context of ICT learning implementation at Pancasila Elementary School. This study focuses on teachers' experiences, perspectives, and obstacles in implementing ICT learning in elementary schools. The research phase began with determining the research subjects, namely, ICT teachers in elementary schools. Data were collected using qualitative methods through direct observation conducted simultaneously with interviews. Interviews were conducted directly with ICT teachers to gather information on the implementation of learning, the supporting facilities, and the obstacles encountered during the learning process. Observations were conducted to assess the condition of the infrastructure and the classroom learning environment.

RESULTS AND DISCUSSION

The implementation of ICT learning at SDN Pancasila Lembang relates to the curriculum, curriculum development, ICT teacher competency, classroom learning implementation, and supporting facilities and infrastructure. Based on direct interviews, it was discovered that SDN Pancasila Lembang was initially a private school. Since its founding, the school has incorporated ICT subjects into its learning activities. Currently, SDN Pancasila Lembang is a public school with an A accreditation and implements the Independent Curriculum in its learning process.

Overall, the school has 598 students, spread across grades I through VI. To support teaching and learning, SDN Pancasila Lembang has 25 teachers, including one specialist in ICT. With this ICT teacher, the school continuously strives to develop students' digital competencies so they can keep up with the ever-evolving developments in ICT.

Implementation of the ICT Curriculum at Pancasila Lembang Elementary School

The presence of the Merdeka Belajar Curriculum also promotes equal access to education in Indonesia through affirmative action policies that support students in the Disadvantaged, Frontier, and Outermost (*Tertinggal, Terdepan, and Terluar*) regions (Nasution et al., 2023). The curriculum development process is an effort to make a comprehensive change from one curriculum to another. The Merdeka Belajar Curriculum was born with the concept of providing freedom of thought and of teachers as the primary drivers of educational success. Implementing this curriculum gives schools the flexibility to determine learning materials, methods, and assessments based on student needs.

In today's digital era, technological developments have a significant impact on the quality of education, with both teachers' and students' activities inextricably linked to the use of digital devices. Interviews at Pancasila Elementary School revealed that the school has been implementing the latest national curriculum since its inauguration by the Minister of Education. This curriculum policy is mandatory for all schools, specifically for ICT subjects. The curriculum development at Pancasila Elementary School is carried out independently by ICT teachers without a dedicated support team. Teachers develop their own curriculum, from teaching modules to the material to be delivered to students, and seek out online resources to adapt the material to the latest technological developments. This was confirmed by an ICT teacher who stated,

“Untuk TIK hanya saya sendiri yang merancang kurikulum pembelajaran mulai dari membuat modul ajar hingga materi yang akan disampaikan kepada murid dari kelas I-VI,”

In addition, ICT subjects at this school are still categorized as elective rather than compulsory, so their status is similar to that of extracurricular activities such as Scouts.

ICT Subject Teacher Competencies

ICT refers to the tools used to manipulate, manage, and transmit information between senders and recipients. In general, basic ICT skills include using word processing, spreadsheet, and presentation software; browsing the internet; using search engines; and communicating via email, chat, and blogs. Basic ICT skills include mastery of computers, application software, the internet, and website management. These skills can be trained and developed to meet the individual's needs (Perdana et al., 2023).

Teacher competency, particularly ICT subject teachers, relates to their ability to master, apply, and develop ICT materials in line with technological advances and student needs. This competency is crucial because the level of ICT mastery among teachers is uneven; some have received training, while others have not.

Teachers who have received training are expected to be able to mentor colleagues who still need assistance in using ICT for learning. School principals are also required to actively disseminate teacher training results to ensure that all educators benefit from them.

Based on the research results, the ICT teachers at Pancasila Elementary School have never received formal or specialized training in this field. However, they still demonstrate a high level of enthusiasm for developing their competencies independently by following technological developments from various sources, especially the internet, and adapting learning materials to student needs and the demands of technology and learning at school. Interestingly, the ICT teacher at this school does not actually have an educational background in information technology. During his higher education, he majored in Business Education at the Indonesian University of Education. However, due to a vacant ICT teacher position at the school, he ended up trying to fill it,

“Saya dulu kuliah di Universitas Pendidikan Indonesia jurusan Pendidikan Bisnis. Karena ada kekosongan posisi di guru TIK, akhirnya saya coba untuk daftar,”

Implementation of ICT Learning at Pancasila Lembang Elementary School

The success of a nation's development depends heavily on the quality of its education, and this quality is determined, in part, by educators, particularly teachers. ICT has three primary functions in the learning process: as an aid, as knowledge, and as a learning literacy aid and material (Anggraeni & Fitria, 2023). Teachers' innovations in learning can introduce new colors that increase students' enthusiasm for learning (Mukaromah, 2020). Therefore, teachers need to use fun teaching methods so that students feel interested and do not get bored during the learning process in class (Indrawati et al., 2022).

In ICT learning, the use of digital media is an effective way to create an interactive learning environment. For example, applications like TikTok can be used as interactive learning media to help students understand the material being taught (Alfiyana et al., 2024). Apart from that, other research indicates that the use of digital media, such as interactive PPTs, can help students understand the concepts presented in a more engaging way (Hidayat et al., 2025). This shows that ICT-based learning media help teachers deliver material more effectively (Ramdani et al., 2021; Rohmatun et al., 2024). In addition, teachers' use of ICT also makes an important contribution, including improving the quality of learning by creating a more engaging and interactive learning experience for students (Lasut et al., 2023).

Research conducted at Pancasila Elementary School in Lembang shows that ICT learning is implemented in stages, aligned with grade levels. In grade I, students are introduced to the basics of computer use with Microsoft Paint, including drawing and recognizing basic shapes. Furthermore, in grade II, students learn to create simple designs using basic graphics applications. Grades III and IV focus on an introduction to Microsoft Word to learn typing, typesetting, and inserting images. Grade V learns to create simple presentation media with Microsoft PowerPoint, while Grade VI is taught to use Microsoft Excel for basic data processing. Grades V and VI also include additional material using the Canva design platform to develop students' digital visual design skills. The learning method employed emphasizes hands-on practice. Teachers provide brief explanations, and students then practice the material independently with teacher guidance, allowing application skills to improve directly during the learning process. However, ICT teachers also face challenges in the learning process,

“Kesulitan saya mungkin agak repot saat menghadapi anak-anak, karena jika mereka mengalami kendala atau masalah dengan komputer dan hal lainnya, saya harus berkeliling untuk mendatangi satu per satu,”

Availability of Learning Facilities and Infrastructure

Based on field observations, data were obtained regarding the completeness of ICT facilities and infrastructure at SDN Pancasila. Details of this data are presented in **Table 1** below.

Table 1. Availability of ICT Facilities at SDN Pancasila Lembang

No	Facilities	Availability	Amount / Description
1	Computer laboratory room	Yes	2
2	Computer / PC	Yes	22
3	Chromebook	Yes	9
4	Internet Network	Yes	12
5	Projector	Yes	1
6	Printer	Yes	1
7	Speaker	Yes	1
8	Table & Chairs	Yes	22
9	Supporting software (MS Office, Canva)	Yes	1

Source: Research 2025

Based on **Table 1**, it is generally understood that Pancasila Elementary School has a range of supporting facilities and infrastructure for ICT learning. The school has two computer laboratories that can support technology-based learning activities. In addition, 22 computers/PCs are available for students and teachers to use in the teaching and learning process. Students engage in various learning activities guided by subject teachers and supported by various available facilities and learning media (Hilmianti, 2021).

The computer lab is used for ICT learning. As an alternative, the school also provides 9 Chromebooks, though this number is still small compared to the total number of computers available. Internet connectivity is available at the school through 12 access points, supporting the smooth running of online learning and the development of digital content by students and teachers.

Other supporting facilities, such as a projector, printer, and speaker, complement learning needs in the computer lab. In addition, 22 sets of tables and chairs are available for student comfort during the learning process. To support practical activities in data processing, document creation, design, and presentations, SDN Pancasila has also provided supporting software, including Microsoft Office and Canva. This software allows students to practice various ICT learning materials appropriate to their grade level.

Overall, the ICT facilities at SDN Pancasila are sufficient to support information technology-based learning. However, several aspects still need improvement, such as increasing the number of Chromebooks and expanding internet access points, to meet the growing needs of digital learning.

Discussion

Based on observations and interviews at Pancasila Elementary School, the implementation of ICT learning continues to face various challenges despite rapid technological developments. In general, aspects of curriculum implementation, teacher competency, learning implementation, and the availability of facilities and infrastructure still need improvement so that the ICT learning process at the elementary school level can meet the demands of today's digital era. The roles and responsibilities of each school, especially teachers, are also needed in maintaining facilities and infrastructure. This is undoubtedly a future challenge that must be overcome.

From a curriculum perspective, the implementation of the Independent Curriculum provides schools with the flexibility to adapt ICT materials to suit students' needs and circumstances. This aligns with the opinion that the Independent Curriculum contributes to equitable education in Indonesia, including in the 3T (frontier and remote) regions (Nasution *et al.*, 2023). However, in practice, implementation is still limited by a lack of human resources and inadequate supporting facilities, which hinders the optimization of the curriculum. As is known, facilities can facilitate and expedite the implementation of an activity, making them a determining factor in learning outcomes (Rasul *et al.*, 2024).

Regarding teacher competency, observations indicate that ICT teachers at Pancasila Elementary School already possess basic skills in operating ICT devices and utilizing the internet as an additional learning resource. This aligns with findings that teachers' use of ICT can expand access to learning resources beyond textbooks (Lestari & Pratama, 2020). However, it is still necessary to improve competencies, especially in digital pedagogy, so that learning becomes more interactive and aligns with the characteristics of digital generation students, as expressed by Indrawan & Marvida (2023). Furthermore, it is important to note that not all teachers can utilize ICT as a learning resource. This is because some senior teachers often struggle to adapt to new technology (Amelia, 2023; Hasri, 2025).

Furthermore, it is important to note that not all teachers can utilize ICT as a learning resource. This is because some senior teachers often struggle to adapt to new technology (Lasut *et al.*, 2023). As is known, only 80% of students in Indonesia have internet access, while the rest still depend on conventional technology (Azri & Raniyah, 2024). Therefore, schools have a responsibility to fulfill this requirement. In practice, students themselves show an interest in ICT learning. This aligns with research findings showing that students prefer ICT-based learning because it is considered modern and engaging. However, schools lack ideal ICT facilities, such as computer labs and adequate equipment to support learning (Mukaromah, 2020). Overall, although ICT learning at SDN Pancasila Lembang is already underway, aspects of teacher competency, development of digital learning media, and provision of infrastructure still need to be strengthened so that learning can run more optimally, innovatively, and relevant to the needs of the times through the support of school digitalization programs and ongoing training.

CONCLUSION

Based on observations, interviews, and documentation conducted at SDN Pancasila Lembang, it can be concluded that the implementation of ICT learning at this school has been going quite well, although it still faces several challenges. The school has implemented the Independent Curriculum, which gives teachers the flexibility to develop an ICT curriculum tailored to student needs. However, this curriculum is still being developed independently by ICT teachers without a dedicated team.

In terms of ICT competency, teachers at Pancasila Elementary School in Lembang, despite lacking an ICT education background or formal training, demonstrate a high level of initiative in independently developing competencies through digital resources. While they have mastered basic ICT tools, further development of digital pedagogical competencies is needed. Learning is conducted in stages using effective hands-on methods, though technical challenges, such as a lack of support when students experience difficulties, remain.

In terms of facilities and infrastructure, SDN Pancasila has The facilities and infrastructure at SDN Pancasila are sufficient to support the ICT learning process, including the availability of computer laboratories, computer devices, and internet networks. Overall, the implementation of ICT learning at SDN Pancasila shows great potential for continued development, but still requires support for improving teacher competency, strengthening infrastructure, and ongoing training programs to create optimal, innovative, and relevant ICT learning with technological developments in the current digital era.

AUTHOR'S NOTE

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