Challenges and Strategies of Digital Literacy in Rural Elementary Schools: A Case Study of SD Negeri 1702 Pir Trans Sosa 1A Padang Lawas Regency

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ABSTRACT

The purpose of this study is to identify barriers and design digital literacy strategies that can be implemented in rural elementary schools. This study is unique because it highlights the underresearched situation in rural elementary schools, specifically SD Negeri 1702 Pir Trans Sosa 1A in Padang Lawas Regency, using a practical approach adapted to the limited facilities. In rural elementary education, the main challenges identified are limited access to information and communication technology, a lack of supporting facilities, and differences in digital skills between rural and urban populations. This study employed a descriptive qualitative method by collecting data through observation, interviews, and document collection. The subjects of the study consisted of teachers, principals, and students involved in the teaching and learning process. Data analysis was conducted using the Miles and Huberman model, which involves data reduction, data presentation, and drawing conclusions. The results show that despite various challenges, there are opportunities to improve digital literacy through several strategic steps, such as conducting regular training for teachers, developing simple digital learning media that can be accessed offline, and establishing active collaboration between schools, parents, and the government. The importance of all parties' roles in creating an educational ecosystem that supports digital literacy was also emphasized. Good digital literacy is expected to increase student participation, develop critical thinking skills, and help them face the challenges of the technological era. With the right strategic support and ongoing collaboration, elementary schools in rural areas can improve students' digital competency and narrow the gap with schools in urban areas.

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Introduction

Education is a consciously planned activity to create a learning environment and teaching process so that students can proactively develop their own potential to possess spiritual and religious strength, self-control, character, intelligence, good morals, and the skills needed by themselves, society, the nation, and the state (Government Regulation Number 67 of 2021, Article 1). Education plays a role in shaping a younger generation with the capability to face the changing times. In a linguistic sense, education can be defined as a process that

changes the attitudes and behavior of individuals or groups in an effort to mature humans through teaching and training. In the current era of the industrial revolution 4.0, information technology advances very rapidly and can be easily accessed even in remote areas. This situation allows people to obtain information very easily, but also presents challenges for them to develop digital literacy skills, such as data and information management.

In today's fully digital era of globalization, advances in digital media and information technology present challenges for users in accessing, selecting, and utilizing information. Furthermore, the ability to browse information also requires accuracy and high quality in the information received by users. The development of information technology now brings not only positive but also negative effects. Information dissemination occurs very quickly, anyone can easily create information, and this information is disseminated through various social media platforms such as Instagram, Facebook, Twitter, and through mobile messaging applications like WhatsApp and others, which are difficult to filter properly. (Silalahi & Faizal, 2022)

Literacy is a positive activity carried out by individuals to obtain information by having the skills to process and understand data when reading and writing. The concept of literacy has now developed rapidly and is divided into various types, one of which is digital literacy. Digital literacy consists of three abilities: mastery of technology, the ability to interpret and understand digital content and assess its credibility, and the ability to innovate, explore, and interact with appropriate tools. Literacy is the most important method to help students solve problems in an intelligent, scientific manner, and in accordance with structured learning. (Naimah et al., 2024)

Digital literacy can be defined as skills related to the processes of reading, thinking, and writing, aimed at improving the ability to understand information critically, creatively, and reflectively. In the context of digital literacy, individuals with this ability can find, evaluate, use, create, and utilize information in a healthy, wise, intelligent, thorough, accurate, and legal manner to carry out communication and interactions in everyday life. According to Paul Gilster, as conveyed in the work of Rulli Nasrullah (2017:16), digital literacy is the ability to understand and use information in various forms originating from various sources that can be accessed through computer devices. (Tuna, 2021)

Elementary schools, as the earliest educational institutions, play a crucial role in building the foundation of digital literacy for students. At this stage, students are introduced to basic skills such as reading, writing, arithmetic, and digital literacy. Therefore, it is crucial to understand how schools in rural areas can develop digital literacy strategies despite limited resources. SD Negeri 1702 Pir Trans Sosa 1 A, located in Padang Lawas Regency, is one such elementary school located in a rural area. Its distance from the city center severely limits access to information technology facilities. This situation presents unique challenges in implementing digital literacy, for both teachers and students.

There is a difference between rural and urban communities in accessing information regarding digital literacy, known as the digital divide. This gap occurs at the individual, family, and geographic levels, based on variations in social and economic status that affect opportunities for exposure to, access to, and use of Information and Communication Technology (ICT) in various activities. This digital divide is most evident in communities with economic limitations living below the poverty line or in rural communities who experience difficulties in accessing ICT. It can be concluded that the digital divide is influenced by various factors such as age and education level. This is certainly not in line with the mandate of the National Education System Law. (Sundah & Karo, 2022)

Some of the main challenges faced by schools in rural areas include a lack of facilities, such as internet access, computer equipment, and digital learning resources. Furthermore, teachers' ability to integrate technology into the teaching and learning process is also a crucial aspect influencing the success of digital literacy in these educational institutions. Furthermore, children in rural schools also face barriers to accessing technology at home. Many students come from families with low economic status, so ownership of digital devices remains very limited. This situation further widens the digital literacy gap between rural and urban schools.

However, various approaches can be designed to overcome these obstacles. These approaches include improving teacher skills through digital literacy training, maximizing the use of existing devices, and creating simple yet effective digital-based teaching methods. Collaboration between schools, parents, and the government is crucial to building a supportive digital literacy ecosystem. Research conducted at SD Negeri 1702 Pir Trans Sosa 1 A is crucial to examine because it can provide concrete insights into the challenges and approaches to digital literacy in elementary schools in rural areas. The findings of this study are expected to serve as a reference for other schools in areas with similar conditions in developing digital literacy.

Children who learn digital skills from an early age are generally better prepared to face future academic and social challenges. The ability to think critically, adapt to digital devices, and utilize online resources are now indispensable skills in the technological age. Furthermore, digital literacy can increase student participation in the learning process by providing more interactive and engaging methods. This research aims to address this gap, as there are still few studies specifically addressing the digital literacy competencies of elementary school teachers, particularly regarding their application in the classroom. Most previous research has focused on students' digital literacy or technology use in general, rather than on the specific role of teachers in learning. (Fradana, 2025)

Furthermore, this study is expected to contribute to the process of equalizing education in Indonesia. Access to digital literacy should not only be available to students in urban areas, but should be a right for every child of the

nation without exception. With the right approach, schools in rural areas can also produce a generation skilled in the digital world. Based on this background, the purpose of this study is to examine the challenges faced by SD Negeri 1702 Pir Trans Sosa 1 A in implementing digital literacy and the tactics designed to overcome them. Therefore, this research has value not only in an academic context, but also practically in supporting the development of digital literacy in elementary schools in rural areas.

Methods

This study employed a qualitative approach with a descriptive nature. The subjects consisted of 10 teachers, 1 principal, and 34 students. Data collection was conducted through observation of the learning process, in-depth interviews with teachers and principals, and document collection regarding digital literacy activities at the school. Observations were conducted by observing daily activities at the school, particularly those related to the implementation of the digital literacy program at the institution. To analyze the data, the Miles and Huberman model was used, which includes data reduction, data presentation, and conclusion drawing or verification. Data validity was strengthened by the use of source triangulation and technical triangulation. The research location plays a crucial role in solving problems during the study, as it can supply accurate data. The research location is SDN 1702 Pir Trans Sosa 1 A, located in Pir Trans Sosa 1 A Village, Padang Lawas Regency.

Finding

Public Elementary School 1702 Pir Trans Sosa IA is located in Pir Trans Sosa 1A Village, East Sosa District, Padang Lawas Regency, North Sumatra. This school is located in a rural area where the majority of the population is farmers. The existence of this school is vital because it is the only place to receive formal basic education in the transmigration settlement area. The school was founded in 1991 as part of a government initiative to provide basic education in transmigration areas. The purpose of establishing this school was to provide access to education for children from families who had transmigrated and lived in the Sosa area. Over time, this school has experienced significant growth both in the number of students and the facilities available.

SD Negeri 1702 is a public educational institution under the auspices of the local government. Based on its most recent accreditation in 2018, the school received a B rating. This rating indicates that the school has met minimum standards for providing educational services, although several aspects still require improvement. Currently, the school has approximately one hundred students, with a nearly equal proportion of boys and girls. This small number of students allows for closer interaction between teachers and students, but also indicates limited capacity and community interest in continuing their children's education to the full elementary level.

The school has approximately ten active teachers, plus educational staff who assist with administration. Most of the teachers are local, with some already serving as civil servants and others on contractual terms. The limited number of teachers results in a heavy teaching load, as one teacher often has to teach multiple subjects. The school's current leadership is led by Nurminta Hasibuan, S.Pd., as principal. She plays a crucial role in maintaining stable school management, mentoring teachers, and building relationships with the surrounding community. Solid leadership support is a crucial element in maintaining the sustainability of schools in rural areas.

The school has begun gradually implementing the Independent Curriculum. However, its implementation has encountered several obstacles due to limited resources and a lack of adequate technological facilities. Teachers tend to rely more on traditional approaches such as lectures, blackboards, and textbooks, while technology use remains very low. In terms of facilities, the school has several classrooms, most of which are in good condition, although some have suffered minor to moderate damage. Furthermore, there is a modest library with a collection of books for students to read. However, laboratory facilities, particularly computer labs, are still lacking, making students less accustomed to using digital devices at school.

The school is equipped with sanitation facilities consisting of four toilets. While this is sufficient to meet students' needs, maintenance issues often arise due to limited operational funds. The school environment is generally clean, but during the rainy season, waterlogging often occurs, impacting students' learning comfort. The school sits on over 11,000 square meters of land. This large area allows for the addition of facilities such as sports fields or green areas. Unfortunately, much of this area remains vacant and underutilized due to limited funding.

This school is connected to the PLN electricity grid with a power of approximately 900 VA. Although electricity is available, its use is limited to lighting and simple tools. Information technology facilities, such as computers and internet access, are almost non-existent. The lack of ICT support is a major obstacle to improving digital literacy among students. The majority of parents with children at this school work as farmers and are in the low-income category. This impacts their ability to provide additional learning facilities at home, such as computers or internet access. Given the family's modest circumstances, school is the only primary place for children to gain knowledge.

Despite limited facilities, the learning culture at this school is quite good. Teachers strive to create a supportive learning environment, and students demonstrate enthusiasm for their lessons. Relationships between students are also quite close because their numbers are small, fostering a sense of community and mutual support. The main challenge facing this educational institution is the lack of access to digital technology. Despite the development of digital education, the school is still not connected to the internet, making learning that relies on

technology almost impossible. Its geographical location in a rural area also results in unstable telecommunications signals, which makes it difficult for teachers and students to access online learning materials.

Despite facing many challenges, SD Negeri 1702 Pir Trans Sosa 1A has the potential to grow. Support from the local and central governments in the school's digitalization program could be a first step toward improving information and communication technology (ICT) facilities. With a relatively small student population, digital literacy programs can be managed more effectively and measurably. If adequate infrastructure is provided, this school has the potential to become a model for digital transformation in rural areas.

Discussion

Digital Literacy Challenges at SD Negeri 1702 Pir Trans Sosa 1A

Public Elementary School 1702 Pir Trans Sosa 1A is located in a rural area, with a small student population of around 100, and minimal school resources. This situation makes it difficult to meet the needs of ICT facilities such as computers, laptops, and laboratories; without adequate equipment, efforts to improve digital literacy in schools are often hampered from the start. Research on the use of digital teaching materials in elementary schools also reveals similar problems related to the inadequacy of existing devices. Lack of internet access in schools, according to Dapodik data, indicates that schools without internet connections are a major structural obstacle. Without a stable network, neither teachers nor students can access online learning materials, instructional videos, or the widely used educational platforms currently available. Research on the issue of digitalization in learning in madrasas and schools in remote areas has shown that network limitations have a significant impact on the effectiveness of digital learning. (Tempur, 2024)

Although schools have electricity (around 900 VA), the availability and stability of electricity impact the continued use of electronic devices. In many rural schools, power constraints mean devices can only be used sparingly or on specific occasions, preventing digital literacy activities from becoming a regular feature. Literature on digital learning transformations indicates that electricity infrastructure is often overlooked, despite its critical importance for information and communication technology (ICT) in schools. Teachers at SD 1702 generally teach multiple subjects and have only 10 teachers, making finding the work and time to participate in digital literacy training challenging. Without ongoing training, teachers tend to use traditional methods (such as blackboards and textbooks) and are unable to develop digital-based learning. Research on digital literacy empowerment programs for teachers highlights that training and support are key factors in enabling teachers to implement ICT in the teaching and learning process. (Taufik et al., 2023)

Digital competencies among students vary: some may be familiar with mobile phones for entertainment purposes, but lack the skills to utilize the internet as a valuable learning resource (such as verifying sources or sorting information). While official curricula may encourage the development of digital competencies, the reality on the ground shows that students in rural areas are still less familiar with academic-related digital literacy. Research on the importance of digital literacy for elementary school students highlights this gap. (Setiani & Barokah, 2021)

The socioeconomic status of students' families in Pir Trans Sosa 1A (mostly farmers, with lower-middle incomes) hinders the ownership of personal devices and internet access at home. Therefore, digital literacy interventions that rely on home learning (either online or a combination) are less effective, as students lack devices or internet access. Field research conducted in rural contexts also reveals a strong relationship between family economic status and children's access to digital literacy. (Hana Thifal Hanifah et al., 2024)

Parental perceptions and support for digital literacy skills have a significant impact. In some rural areas, parents are not yet fully aware of the benefits of digital education or are concerned about inappropriate content, resulting in a lack of support from home. Research on digital literacy education models in villages suggests a socialization approach to parents to make them partners in improving children's digital literacy. The curriculum and policies implemented at SD 1702 have adopted the Independent Curriculum, but the implementation of digital literacy requires adjustments to local conditions. Materials, tools, and methods must be adapted to village conditions to be more relevant. (Putrayasa et al., 2024)

The limited number of digital libraries and electronic teaching materials in schools means that students have limited opportunities to practice searching, evaluating, and creating digital content. Even with physical libraries, the lack of digital collections hinders the development of digital information literacy. Research on the use of technology-based learning media emphasizes the importance of having digital resources aligned with the curriculum. In terms of management, funds allocated for the procurement and maintenance of information and communication technology devices are often very limited; funds are often prioritized for basic needs. This situation hinders efforts to provide computer laboratories or digital learning devices. Evaluation studies of learning digitization programs indicate that program sustainability depends on continuous funding and specific budget planning for information and communication technology.

Geographical disparities, such as distance to cities or districts and road conditions, complicate collaboration between schools and training institutions or universities that could support digital literacy development. Many successful programs in urban areas are difficult to implement in rural areas without strong collaboration and logistical support. Literature discussing digital literacy education models in rural communities recommends intersectoral partnerships. There are also issues related to digital security and ethical understanding in technology use: without guidance, students are easily exposed to inappropriate content, fake news, or data misuse. Schools need to teach digital literacy that encompasses security and ethics, not just technical skills. Research on digital literacy learning emphasizes the importance of security and ethics as part of the curriculum. A lack of confidence or fear of making mistakes can hinder teachers' and students' motivation to use technology. Without regular practice and

technical support, existing devices and platforms can become an additional burden. Studies on the development of digital literacy-based learning models demonstrate the need for mentoring to increase user confidence.

Digital Literacy Strategies That Can Be Implemented

- 1. Regular and contextual digital literacy training for teachers is one of the relevant strategies for SD Negeri 1702. Teachers' ability to use basic ICT tools, choose appropriate digital media, and implement digital learning despite limited infrastructure is crucial. For example, the study "Digital Literacy Training for Teachers at SD Negeri 1702 Pir Trans Sosa 1A" showed that the use of workshop and discussion methods in training successfully improved teachers' understanding of the use of learning resources from the internet and social media.
- 2. Engaging teachers and students simultaneously in digital empowerment programs can improve efficiency. A digital literacy empowerment program at the One Roof Elementary and Middle School in Seraya Marannu Village, West Manggarai Regency, using Google Workspace and AI materials for teachers and students demonstrated that with formal support, initial limitations in technology use can be overcome. For SD 1702, a similar approach could be implemented by adapting training materials to the available devices. (Maulana El-Haq & Muizu, 2025)
- 3. Because SD 1702 does not have a school internet connection, developing digital-based learning media with low bandwidth can be an important strategy. Teachers can create media such as offline videos, audio materials, and light presentation slides themselves or collaborate with external parties. An example of this practice was found in a teacher training study in Pulo Gadung District, where a digital literacy website and a video-making website were used as creative media.
- 4. While waiting for computer equipment/computer labs to be provided, using simple devices like mobile phones/gadgets can be part of the plan. Teachers can set up digital assignments or materials that can be accessed offline or through local storage so students can continue learning digital literacy even if they don't always have internet access.
- 5. In addition to one-time training, mentoring and intensive support for teachers is another successful approach. More experienced educators can assist, or they can collaborate with universities, mentor teachers, or local information technology communities to do so. A study, "Mentoring to Improve Technology Literacy for Educators in Border Areas," found that evaluating digital learning is one of the practical challenges in the field that cannot be solved by training alone. (Silvester et al., 2023)
- 6. Integrate digital literacy into the school curriculum gradually but continuously, such as through local content or themes. For SD 1702, digital literacy can be used in subjects such as Physical Education, Science, and Social Studies, with assignments requiring the use of simple technology or student digital work.
- 7. To enable teachers at SD 1702 to share experiences, materials, and solutions to technical problems, teachers in the surrounding area should

form digital learning communities. Teacher Working Groups (KKG) or local online forums are two ways in which these communities can be formed. As shown by the study "Improving Teacher Competence in Managing Digital Literacy-Based Learning," active teacher involvement in training and teamwork has a positive effect on the use of information and communication technology (ICT) in the classroom. (Aminuddin et al., 2024)

- 8. Provide support to parents to understand and support their children's digital literacy at home. Since many students at SD 1702 may not have internet access at home or share devices, digitally literate parents can help their children study, monitor assignments, or provide time and moral support. According to several studies, parental involvement in the socialization of training and the use of digital media is also necessary for effective digital literacy.
- 9. Conduct regular evaluations and reflections on digital literacy, including successful materials, barriers, and differences between teachers and students. For example, evaluate students' ability to use digital media, device utilization, access stability, the effectiveness of digital assignments, and emerging issues. This strategy is crucial to ensuring that the digital literacy program at SD 1702 is not static but evolves as needed. (Nurpadilah & Mukhlis, 2023)
- 10. To obtain material support, training, devices, or digital resources, collaborate with education agencies, universities, NGOs, or technology institutions. By working together, village schools like SD 1702 can gain access to digital educational resources, professional training, or assistance with devices that would be too expensive to finance on their own. The digital transformation in Jatiagung village in Lampung is a close example of how educational software and hands-on practice are used in teacher and educator training. (Ferdiansyah & Mariya, 2024)

Conclusion

This study shows that the main issues in implementing digital literacy at SD Negeri 1702 Pir Trans Sosa 1A are the lack of ICT facilities, internet network, teacher skills, and economic and social support from parents. However, approaches such as ongoing teacher training, the use of simple and accessible learning media without internet, and collaboration between schools, parents, and the government can be effective solutions. This model can be implemented in the field by creating a digital learning community for teachers, involving parents in promoting digital literacy, and collaborating with external organizations to improve existing facilities. The results of this study emphasize the importance of conducting further research on teacher mentoring models in rural schools and the development of locally based and relevant digital learning media, so that digital literacy not only improves student skills but also reduces the digital divide between rural and urban schools.

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