

THE IMPACT OF DIGITAL LITERACY PROGRAMS ON STUDENTS' CRITICAL ABILITIES IN VOCATIONAL HIGH SCHOOLS (SMK)

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Abstract

This research aims to examine the role of digital literacy in enhancing the critical thinking skills of Vocational High School (SMK) students, with a focus on information analysis, creativity, and problem-solving skills in the technological era. The study was conducted using a systematic literature review method on journal articles, proceedings, books, and research reports published within the last 5–10 years. The analysis results show that digital literacy helps students effectively find, evaluate, and utilize information, as well as improve their ability to identify valid arguments and avoid false information. Additionally, digital literacy serves as a driver of creativity, enabling students to design innovative solutions to real-world problems in vocational fields, including thru the integration of technology in project-based learning. Identified challenges include infrastructure limitations, a lack of teacher training, and the digital divide among students, necessitating strategies to strengthen digital literacy programs in schools. This research recommends developing education policies that support equitable access to technology, enhance teacher competency, and foster cross-sector collaboration to strengthen digital literacy in vocational high schools. These findings are expected to serve as a reference for schools, teachers, and policymakers in designing effective digital literacy programs to equip students with critical thinking and adaptability skills in response to technological advancements.

Keywords: Digital Literacy Program, Critical Thinking Skills, Vocational High School

INTRODUCTION

The development of information and communication technology (ICT) has brought significant changes to the world of education, including at the vocational high school (SMK) level. The internet, digital devices, and social media are now an integral part of students' learning activities. This condition demands that students possess the skills to effectively access, understand, and utilize information. Digital literacy is becoming one of the important competencies to address these challenges (Puspita, 2024). In the digital age, students are not only required to master the technical skills of using

technology, but also critical thinking abilities in managing information. This ability determines the quality of learning and students' readiness to face the world of work.

Vocational high schools have learning characteristics that emphasize practical skills and work readiness. Thus, mastering digital literacy can help students develop competencies in line with the needs of modern industry. In various professional fields, the use of digital technology has become an operational standard, so students are required to be able to adapt these skills from their school years. However, mastering technology without critical thinking skills will pose risks, such as being trapped by false or misleading information or making poor decisions. Strong digital literacy is expected to serve as a filter against invalid information (Aksenta & Kadang, 2024). Therefore, digital literacy and critical thinking skills must go hand in hand.

Critical thinking skills in vocational high school students include the ability to analyze, evaluate, and synthesize information to solve problems. In the context of digital literacy, this ability plays a role in filtering accurate and relevant information from various online sources (Destiana et al., 2023). A well-designed digital literacy program can guide students to think more reflectively and analytically. Students with critical thinking skills will find it easier to discover innovative solutions in their field of expertise. This is important, considering the challenges in the workplace require logical and data-driven thinking (Adhikari & Joshi, 2024). Digital literacy serves as the gateway to building this mindset.

Digital literacy programs in vocational high schools typically include training on software usage, information search skills, and digital ethics and security. However, the effectiveness of this program heavily relies on teaching methods and teacher involvement. Teachers who comprehensively understand the concept of digital literacy can integrate it into project-based learning (Ramadhan & Mardin, 2023). With this approach, students will be more active in seeking and processing information rather than simply receiving material. Additionally, integrating digital literacy into learning can increase students' motivation to learn. Interactive learning experiences encourage them to think critically and creatively.

The main challenge in implementing digital literacy in vocational high schools is the infrastructure and skills gap between schools in urban and rural areas. Not all students have equal access to devices and adequate internet connections. This condition can hinder the equitable success of digital literacy programs (Angeli, 2024). Additionally, the varying levels of teachers'

technological proficiency also impact the quality of program implementation. Teachers who are less familiar with technology tend to find it difficult to utilize digital resources for critical learning (Arif et al., 2024). Therefore, increasing teacher capacity is becoming an important priority.

Beside infrastructure factors, students' learning culture also affects the effectiveness of digital literacy. Some students tend to use technology for entertainment rather than learning. This habit makes them less accustomed to thinking critically when accessing information (Yao & Tian, 2023). An effective digital literacy program must be able to change this behavioral pattern by guiding students toward productive technology use (Warizal et al., 2023). This habituation requires a consistent approach and support from the school environment. Thus, digital literacy can truly contribute to improving students' critical thinking abilities.

Previous research has shown that digital literacy has a positive relationship with students' critical thinking skills. Students who are accustomed to evaluating information from various online sources tend to have a deeper level of understanding (Safitri, 2023). A structured digital literacy program can build analytical skills, logical reasoning, and data-driven decision-making. However, some studies also found that digital literacy does not automatically improve critical thinking skills unless accompanied by learning that encourages reflection (Trymelynda & Ekawati, 2023). Therefore, teaching approaches that emphasize collaboration, discussion, and problem-solving become important. This needs to be considered in the design of vocational high school curricula. In Indonesia, various government and private initiatives have been launched to improve digital literacy, including for vocational high school students. Programs such as teacher training, the provision of e-learning platforms, and technology-based competitions are part of this strategy. Nevertheless, the success of this program still requires ongoing evaluation. Some schools successfully utilized this program to develop creative learning, while others are still facing implementation challenges. This difference in results highlights the need for an in-depth analysis of the factors influencing the effectiveness of digital literacy programs. This analysis can serve as the basis for improving education policies (Amin & Adiansyah, 2023).

A literature review on the impact of digital literacy programs on vocational high school students' critical thinking skills is important to provide a comprehensive overview. By examining the results of previous studies, patterns of success, challenges, and the best strategies that can be applied

can be identified. This study also helps formulate evidence-based policy recommendations. Considering the rapid development of technology, data updates and analysis are necessary to keep education policies relevant. Without adequate study, digital literacy programs risk becoming a formality without significant impact on students' skills (Wahyuni, 2023). Therefore, a literature review is a strategic initial step.

Based on the description, this study aims to deeply examine the literature discussing the relationship between digital literacy programs and the critical thinking abilities of vocational high school students. This study will identify program success indicators, implementation barriers, and effective development strategies. With a focus on the context of vocational education, this study is expected to contribute to the development of digital literacy-based curriculum and teaching methods. The study's findings can serve as a reference for teachers, schools, and policymakers in improving the quality of education in vocational high schools. Additionally, the results of this research can enrich academic literature in the field of educational technology. Ultimately, effective digital literacy is expected to produce SMK graduates who are critical, adaptable, and ready to compete in the workforce.

RESEARCH METHOD

This study uses secondary data sources consisting of scientific journal articles, seminar proceedings, reference books, and research reports relevant to the topic of digital literacy and critical thinking skills in Vocational High School (SMK) students. The publication range used is limited to the last 5 to 10 years to ensure the relevance and currency of the information. Inclusion criteria include literature discussing digital literacy programs, critical thinking skills measurement, or the relationship between the two in the context of vocational education. Meanwhile, exclusion criteria were applied to literature that lacked clear empirical data, was not relevant to the vocational high school context, or was purely opinion-based without research foundation. Literature selection was conducted thru searches in scientific databases such as Google Scholar, ScienceDirect, and DOAJ. This process aimed to ensure that the sources used had adequate academic quality and credibility.

The data analysis technique used for the literature is a systematic literature review with a narrative synthesis approach. This process began with the collection of literature that met the criteria, followed by information extraction including research objectives, methods, findings, and their implications. Subsequently, the data were analyzed to identify key themes,

relationship patterns, and differences in results across studies. The analysis results are presented in the form of a narrative description that combines findings from various sources to form a complete understanding. This approach allows researchers not only to present a summary of the data but also to provide a critical interpretation of the literature reviewed. Thus, this study can provide a comprehensive picture of the impact of digital literacy programs on the critical thinking abilities of vocational high school students (Snyder, 2019; Tranfield et al., 2003).

RESULT AND DISCUSSION

The Role of Digital Literacy in Developing Information Analysis Skills

Digital literacy is becoming a key skill for vocational high school students in navigating the vast flow of information in the digital age. With adequate digital literacy skills, students can utilize technology to access a wide range of information sources, including the internet, e-books, and online learning platforms. Mastering these skills helps them find information relevant to their field of expertise. This information search process not only depends on technical ability, but also on critical awareness in choosing the right keywords. Trained students will be more efficient in finding information that can support school assignments or projects (Pradhan, 2024). This is an important foundation for developing information analysis skills.

The ability to find relevant information is not enough if it is not accompanied by the ability to evaluate the quality of that information. Digital literacy teaches students to check the credibility of sources, compare information from multiple references, and identify potential biases. In the context of vocational high schools, this skill is very important because students are often exposed to technical information that requires a high degree of accuracy. For example, in the field of engineering, misinformation can be fatal to the outcome of the work. Proper evaluation allows students to avoid using incorrect or outdated data (Arrosyid & Romadlon, 2023). Thus, digital literacy directly promotes accuracy in the information analysis process.

Beside evaluating, students also need to have the ability to use information effectively in the context of learning and problem-solving. Digital literacy helps them filter relevant information and integrate it into reports, presentations, or work products. The appropriate use of information will improve both the quality of students' academic output and their practical skills. In project-based learning, for example, the ability to select accurate data can determine the success of the final outcome. Students who are proficient

in digital literacy tend to be more capable of accurately integrating theory and practice (Bajwa, 2023). This has a positive impact on their readiness to face the challenges of the working world.

One significant benefit of digital literacy is its ability to improve the skill of identifying valid arguments. Trained vocational high school students will be able to distinguish between fact and opinion, and recognize arguments supported by strong evidence. This skill is important to prevent them from accepting raw information without critical thinking. For example, when searching for information about a specific work method, they can check whether the data used comes from a legitimate and verifiable source. Thus, students become not only consumers of information, but also active evaluators of information. This process directly strengthens their analytical abilities (Anasuya, 2024).

Digital literacy also helps students avoid the spread of false or hoax information. They learn to recognize signs of invalid information, such as unclear sources, inconsistent data, or the use of manipulative language. This ability is highly relevant in the age of social media, where information spreads very quickly. Students who can identify hoaxes will be more discerning in sharing information with others (Krumsvik, 2024). This also fosters a sense of responsibility in using digital technology and media. Thus, digital literacy serves as a filter against unreliable information.

Mastering information analysis skills thru digital literacy has a direct impact on the learning process in vocational high schools. Students who can analyze information well can produce more original and high-quality work. They are also more confident in discussions because the arguments they present are supported by valid data. In both practical and theoretical exams, students with high digital literacy tend to be able to provide logical and evidence-based answers. This shows that digital literacy is not just an additional skill, but an integral part of academic success (Durmuş, 2024). Therefore, vocational high school curriculum developers need to include digital literacy as a core competency.

Strong information analysis skills also provide a competitive advantage for vocational high school students in the workplace. Companies are looking for employees who are not only technically skilled but also capable of making decisions based on accurate data analysis. Digital literacy equips students to adapt to a work system that is increasingly reliant on technology. For example, in the creative industry, the ability to find and validate market trend information can determine the success of a product (Boğa & Yılmaz, 2024).

Similarly, in the field of engineering, the accuracy of information affects safety and work efficiency. Thus, digital literacy becomes an important asset for vocational high school graduates who wish to compete professionally.

Overall, digital literacy plays a significant role in developing the information analysis skills of vocational high school students. By finding, evaluating, and using relevant information, students can improve their critical thinking skills. The ability to identify valid arguments and avoid false information strengthens their competitiveness in both academic and professional fields. Therefore, digital literacy programs must be designed not only to teach technical skills, but also evaluative and ethical aspects. Integrating digital literacy into daily learning will foster a culture of critical thinking within the school environment. Thus, the goal of vocational high school education to produce graduates who are ready for work and adaptable to change can be achieved.

Digital Literacy as a Driver of Creativity and Problem Solving

Digital literacy not only serves as an information-seeking skill but also acts as a catalyst in developing the creativity of vocational high school students. Mastering technology provides students with the opportunity to explore various sources of ideas from around the world. Through digital platforms, they can find design inspiration, work methods, or product innovations relevant to their vocational field. This wide access to information allows students to combine various concepts into new and creative solutions (Ojo, 2022). This creativity further develops when students are able to utilize digital devices to create prototypes or simulations. Thus, digital literacy plays a direct role in stimulating innovative ideas.

The ability to design innovative solutions is highly needed in vocational high schools, considering the orientation of vocational education is to prepare graduates ready to face the challenges of the working world. Digital literacy facilitates students in identifying real-world problems in the workplace and seeking alternative solutions. By using online resources, students can learn about various approaches that have been implemented in the industry. This knowledge was then adapted to create solutions suitable for the local context (Matsunaga, 2024). This process trains students to think creatively while also being realistic. This is what makes digital literacy a driver of innovation in vocational education.

Integrating digital literacy into learning encourages students to experiment with various creativity-supporting technologies. For example,

graphic design students can use the latest design software to create visually appealing and functional visuals. Meanwhile, engineering students can utilize simulation software to test machine designs before the production process. This experiment reduces the risk of failure and allows students to make improvements from an early stage. Digital literacy also helps them present ideas more professionally thru interactive media (Susano, 2024). All of this shows how technology comprehensively supports the creative process.

Problem-solving in vocational fields often requires collaboration between individuals with different backgrounds. Digital literacy facilitates this collaboration thru online platforms that allow students to share ideas and work on projects simultaneously. Digital collaboration teaches students to combine technical expertise with effective communication skills. In interdisciplinary projects, students can combine knowledge to create more holistic solutions (Islam & Khan, 2024). This process not only enhances creativity but also project management skills. This will be a valuable asset as they enter the workforce, which prioritizes technology-based teamwork.

A case study on the successful integration of technology in vocational high school learning shows that digital literacy is able to improve the quality of students' project outcomes. For example, in a technical vocational school, students use CAD (Computer-Aided Design) software to design machine components that are then produced using a 3D printer. This project not only results in a functional product but also trains students in the design, testing, and evaluation process. This success proves that the use of modern technology can accelerate the innovation process. Students involved in projects like this show a significant improvement in creativity and problem-solving skills (Bećirović, 2023). This is concrete proof of the benefits of digital literacy in vocational high schools.

Another example can be found in vocational high schools with culinary arts programs, where students use digital media to research global culinary trends. They then adapted international recipes into products that suited local tastes. This process involves experimenting with ingredients, cooking techniques, and creating appealing product presentations. Digital literacy makes it easier for students to document their work thru photos, videos, and social media marketing. This not only develops creativity but also equips students with digital marketing skills (Rachmawati et al., 2022). In this way, technology becomes a means of connecting creativity with real business opportunities.

The integration of technology in learning also motivates students to continue learning and innovating. Access to online courses, tutorials, and discussion forums allows them to develop new skills independently. This independence shapes a lifelong learner mindset that is highly needed in the workplace. Digital literacy encourages students not to stop at the knowledge provided in class, but also to seek additional knowledge from various sources. When faced with new problems, students are trained to seek references and try different solutions (Bolivar, 2023). This makes digital literacy a tool that strengthens students' adaptability and creativity.

Overall, digital literacy has proven to be a major driver of creativity and problem-solving in vocational high schools. Its connection to the ability to design innovative solutions is evident from the various successful projects that have been implemented. Case studies from various departments show that integrating technology into learning can improve the quality of students' ideas and work. With adequate infrastructure support and teacher training, the potential for digital literacy can be optimized. Therefore, digital literacy programs should be positioned as a core learning strategy, not just an add-on. By doing so, vocational high schools can produce graduates who are creative, adaptable, and competitive in the modern workforce.

Challenges and Inhibiting Factors in Improving Critical Thinking Skills

One of the main challenges in improving vocational high school students' critical thinking skills thru digital literacy is the barrier to accessing technology. Not all schools have computer equipment, stable internet connections, or the latest software needed for digital learning. This condition makes it difficult for students in remote areas to participate in digital literacy programs optimally. Uneven infrastructure leads to disparities in digital skills acquisition among students (Battel & Pearl, 2024). As a result, some students have greater opportunities to develop critical thinking skills than others. This access issue has become a priority that must be addressed for digital literacy programs to be implemented evenly.

Limited teacher training is also a significant obstacle to effectively implementing digital literacy. Many vocational high school teachers have not received adequate training to integrate technology into their lessons. As a result, digital literacy-based learning often focuses solely on device usage, rather than on developing students' critical thinking skills. Teachers who are less familiar with technology tend to rely on traditional methods with minimal digital exploration. This condition means that the potential of digital literacy is

not being utilized optimally (Tian et al., 2023). Therefore, improving teacher competency is a key step in this program.

The digital divide between students is also a factor influencing the success of digital literacy programs. Students who have personal devices and internet access at home certainly have a greater opportunity to practice and develop their skills. Conversely, students who only rely on school facilities will have limited study time. This difference creates an imbalance in abilities that can affect overall learning outcomes. Additionally, the digital divide also impacts students' confidence in participating in technology-based discussions or projects (Kumari, 2023). To address this, schools need to provide facilities that are equally accessible to all students.

Another challenge is the lack of systematic integration of digital literacy into the curriculum. In some vocational high schools, digital literacy is still considered an additional subject, not an integral part of the learning process. This makes its application less consistent and only appears in certain activities. In fact, critical thinking skills require continuous practice across various subjects. Without strong integration, students find it difficult to develop a stable critical mindset (Jin & Liu, 2024). Therefore, the curriculum needs to be designed so that digital literacy becomes an integral part of every lesson.

Student motivation factors should also not be overlooked in developing critical thinking skills thru digital literacy. Some students only use technology for entertainment, such as playing games or accessing social media, without utilizing it for learning. This habit can reduce the effectiveness of digital literacy programs. An approach is needed that can direct students' interest toward the productive use of technology (Devi et al., 2022). For example, teachers can integrate social media or popular applications into educational learning activities. By doing so, students will feel more motivated to develop their digital skills.

Additionally, cultural and mindset challenges can also hinder the development of critical thinking skills. Some students are accustomed to accepting information without questioning its truth, making them less trained in analysis. This is exacerbated by a learning environment that does not encourage healthy discussion or debate. Effective digital literacy requires a learning environment that encourages students to ask questions, critique, and test information. Without this change in mindset, technology will only be a passive tool (Sursaeva, 2022). Therefore, it is important to build a school culture that supports critical thinking.

To overcome these obstacles, a strategy is needed to strengthen digital literacy programs in vocational high schools. First, the government and schools need to ensure the equitable availability of technological infrastructure. Second, teachers must receive regular training to be able to utilize technology for critical learning. Third, digital literacy programs must be integrated into the curriculum and implemented sustainably. Fourth, schools need to create project-based activities that hone analytical and problem-solving skills (Supartin, 2023). These strategies will help ensure that digital literacy truly contributes to students' critical thinking abilities.

Overall, the challenges and obstacles faced in developing critical thinking skills thru digital literacy in vocational high schools are quite complex. Barriers to access, limitations in teacher training, and the digital divide between students are key factors that need to be addressed. With the right reinforcement strategies, these barriers can be transformed into opportunities to improve the quality of vocational education. Collaboration between schools, the government, and industry is key to the successful implementation of digital literacy programs. The expected outcome is SMK graduates who are not only technically proficient but also possess strong critical thinking skills. That way, they will be better prepared to compete in an increasingly technology-based world of work.

CONCLUSION

Based on a literature review, digital literacy programs have a significant impact on improving the critical thinking skills of vocational high school students, particularly in the aspects of information analysis, problem-solving, and decision-making. Digital literacy enables students to be more effective in finding, evaluating, and using relevant information, while also avoiding false information. Integrating digital literacy into vocational high school learning also encourages students' creativity in designing innovative solutions to real-world problems in their vocational fields. Nevertheless, there are challenges such as the digital divide, limited teacher training, and differences in students' digital skills that need to be addressed for optimal benefits. These findings indicate that digital literacy is not just an additional competency, but a fundamental need in the era of Education 4.0. The practical implications of these findings include the need for more proactive school policies in providing technological resources and teacher training, as well as the implementation of a curriculum that emphasizes digital literacy on an ongoing basis. Teachers need to be equipped with adaptive teaching methods so they can effectively

integrate digital literacy in the classroom. The government and policymakers are also expected to provide support thru national programs focused on equalizing digital access across all vocational high schools. Further research could focus on quantitatively measuring the impact of digital literacy on the learning outcomes and 21st-century skills of vocational high school students. Additionally, implementation-based case studies in various regions would provide a more detailed understanding of the success factors of digital literacy programs. Thus, strengthening digital literacy becomes a strategic step in preparing SMK graduates who are critical, creative, and competitive in the modern world of work.

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