

ENHANCING DIGITAL COMPETENCIES THROUGH TECHNOLOGY-ENHANCED LEARNING AMONG STUDENTS AT MI NURUL HUDA BENGKULU

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Abstract

The rapid advancement of digital technology has transformed educational practices and increasingly necessitates the development of students' digital competencies from an early stage of education. This study investigates the role of Technology-Enhanced Learning (TEL) in enhancing digital competencies among students at MI Nurul Huda. The study is grounded in the assumption that the meaningful integration of technology into learning activities can foster not only students' technical proficiency but also their ability to access, evaluate, create, and communicate information effectively and responsibly. Employing a qualitative descriptive approach, this study explores the implementation of technology-enhanced learning, students' engagement with digital learning resources, and the development of their digital competencies through classroom observations, interviews, and relevant documentation. The findings indicate that the integration of digital technologies into learning activities contributes positively to students' digital competencies, particularly in terms of basic technology operation, information access, digital communication, collaborative learning, and responsible use of digital resources. Nevertheless, the effectiveness of TEL is influenced by several factors, including teachers' digital competence, the availability of technological infrastructure, students' varying levels of digital literacy, and the need for appropriate pedagogical guidance. The study concludes that Technology-Enhanced Learning can serve as an effective pedagogical approach for strengthening students' digital competencies when technology is integrated purposefully within a supportive learning environment. These findings highlight the importance of continuous teacher development, adequate technological resources, and contextually relevant digital learning strategies to ensure the sustainable development of digital competencies among students at the elementary madrasah level.

Keywords: *technology-enhanced learning, digital competencies, digital literacy, students, elementary madrasah, MI nurul huda*

Introduction

The rapid development of digital technology has brought significant

changes to the educational landscape (Hammond, 2001). Technology is no longer regarded

merely as an additional instrument to support classroom instruction (Fishman et al., 2016); rather, it has increasingly become an integral component of contemporary teaching and learning processes. The integration of digital technologies into education provides opportunities for students to access diverse sources of information (Kalyani, 2024), engage in interactive learning activities, collaborate with peers, and develop competencies that are increasingly required in the digital era. Consequently (Altınay, 2017), educational institutions are expected not only to facilitate students' acquisition of academic knowledge but also to equip them with the digital competencies necessary to participate effectively, critically, and responsibly in an increasingly technology-mediated society (Cheng, 2021).

Digital competence has become an essential component of students' overall educational development (Zhao et al., 2021). It encompasses more than the ability to operate digital devices or use particular applications (Janssen et al., 2013). Students are expected to be able to search for and evaluate information, communicate and collaborate through digital platforms, create digital content, solve problems using technology, and demonstrate awareness of ethical (Vettrisilvan, 2025), responsible, and safe digital practices. These competencies are

particularly important at the elementary education level (Demirdis, 2025), where students begin to establish fundamental learning habits and attitudes toward technology (Thompson, 2013). Early exposure to meaningful and guided digital learning experiences can therefore provide a foundation for the development of lifelong digital literacy and adaptability.

In this context, Technology-Enhanced Learning (TEL) offers a promising pedagogical approach for strengthening students' digital competencies (Mulaudzi, 2024). TEL refers to the purposeful integration of technological tools and digital resources into learning processes to facilitate, enrich, and transform educational experiences (Daniela et al., 2018). Its implementation may involve the use of multimedia learning materials, interactive applications, digital learning platforms, online resources, educational videos, and other technology-supported activities. When appropriately designed, TEL can promote active participation and student-centered learning by providing learners with greater opportunities to explore information, interact with learning materials, and construct knowledge through digital environments (Daniela et al., 2018). However, the mere presence of technology in the classroom does not automatically result in improved

learning outcomes or digital competence. Its effectiveness depends largely on how technology is pedagogically integrated into learning activities.

The implementation of TEL at the elementary madrasah level presents both opportunities and challenges. Students at this level generally demonstrate varying degrees of technological familiarity and digital competence (Taufik & Rusdi, 2024). Some students may have frequent exposure to smartphones, computers, or online media in their daily lives, whereas others may have limited access to digital devices and learning resources. Furthermore, students' ability to use technology for educational purposes may differ substantially from their ability to use it for entertainment or social interaction. This discrepancy highlights the importance of providing structured learning experiences in which technology is used not merely as a means of accessing information but as a tool for critical thinking, communication, collaboration, creativity, and problem-solving.

Teachers also play a central role in determining the success of technology-enhanced learning. Effective TEL requires teachers to possess sufficient digital competence and pedagogical knowledge to select and utilize technologies that are relevant to learning objectives. Teachers are expected to design

learning activities that balance technological innovation with students' developmental needs. In addition, they need to provide appropriate guidance so that students can navigate digital information critically and responsibly. Without adequate pedagogical direction, the use of digital technology may become superficial and may not substantially contribute to the development of students' competencies. Therefore, the successful implementation of TEL should be understood as a combination of technological availability, teacher competence, appropriate instructional strategies, and students' active engagement (Daniela et al., 2017).

MI Nurul Huda, as an elementary-level madrasah, operates within this broader transformation of education. The increasing relevance of digital technology creates a need to examine how technology can be incorporated into learning practices and how such integration contributes to students' digital competency development. Investigating the implementation of TEL in this particular educational context is important because the effectiveness of technology-enhanced learning may be influenced by institutional conditions, teacher readiness, available infrastructure, students' characteristics, and the learning culture of the school. A context-specific investigation can therefore provide a more comprehensive understanding of both

the potential and the limitations of TEL in developing digital competencies among elementary-level students.

Although numerous studies have discussed the relationship between technology integration and students' digital skills, further investigation is needed into how technology-enhanced learning is implemented in specific educational contexts, particularly at the madrasah level. Research focusing on elementary madrasah students is important because their digital competencies are still at a formative stage, while their learning experiences may be shaped by distinctive religious, cultural, and institutional contexts. Examining the ways in which teachers integrate technology, how students respond to technology-supported learning activities, and what factors facilitate or constrain the process can contribute to a more nuanced understanding of digital competency development in madrasah education.

Based on this rationale, the present study aims to investigate the implementation of Technology-Enhanced Learning and its contribution to enhancing digital competencies among students at MI Nurul Huda. The study specifically examines how technology is incorporated into learning activities, how students engage with technology-enhanced learning, and the extent to which such experiences support the development of their digital competencies. In

addition, the study explores the factors that facilitate and hinder the implementation of TEL within the school context. By addressing these aspects, the study is expected to contribute both theoretically and practically to the discussion of technology integration and digital competency development in elementary education, particularly within the context of Indonesian madrasah education.

Research Method

Research Design

This study employed a qualitative descriptive research design to investigate the implementation of Technology-Enhanced Learning (TEL) and its contribution to the development of students' digital competencies at MI Nurul Huda. A qualitative approach was considered appropriate because the study sought to obtain an in-depth understanding of learning practices, students' experiences, and the factors influencing the integration of technology within the educational context (Phutela & Dwivedi, 2020). Rather than measuring digital competence solely through numerical indicators, the study focused on examining how students develop and demonstrate digital competencies through technology-supported learning activities.

Research Setting and Participants

The research was conducted at MI Nurul Huda, an elementary-level madrasah in Indonesia. The research setting was selected because the institution has incorporated digital technology into several aspects of its teaching and learning activities. The participants consisted of students and teachers who were directly involved in technology-enhanced learning activities. The participants were selected purposively based on their relevance to the research objectives and their direct experience with the use of digital technologies in the classroom. The selection of participants also considered the need to obtain diverse perspectives regarding the implementation of TEL and the development of students' digital competencies.

Data Collection Techniques

Data were collected through classroom observations, semi-structured interviews, and documentation. Classroom observations were conducted to examine how technology was integrated into instructional activities and how students interacted with digital learning resources. Particular attention was given to students' ability to operate digital devices, access and process information, communicate and collaborate using technology, and demonstrate responsible digital behavior.

Semi-structured interviews were conducted with selected teachers and students to obtain more detailed information regarding their experiences, perceptions, and challenges related to technology-enhanced learning. The semi-structured format allowed the researcher to maintain consistency across interviews while providing sufficient flexibility to explore emerging issues relevant to the research objectives.

Documentation was used as a complementary source of data. Relevant documents included lesson plans, digital learning materials, students' learning products, photographs of learning activities, and other school-related records associated with the implementation of technology-enhanced learning. The use of multiple data sources enabled the researcher to develop a more comprehensive understanding of the phenomenon under investigation.

Data Analysis

The collected data were analyzed systematically through three interconnected stages: data condensation, data display, and conclusion drawing and verification. During data condensation, information obtained from observations, interviews, and documentation was selected, organized, coded, and categorized according to the focus of the study. The data were then displayed

in the form of descriptive narratives and thematic categories to facilitate the identification of patterns and relationships among the findings.

The subsequent stage involved drawing and verifying conclusions based on the emerging patterns. The analysis focused on several key dimensions of digital competence, including students' ability to use digital technologies, access and evaluate information, communicate and collaborate digitally, create or utilize digital content, and demonstrate responsible and safe digital behavior. The analysis also considered the factors that supported or constrained the implementation of TEL at MI Nurul Huda.

Trustworthiness of the Data

To ensure the credibility and trustworthiness of the findings, the study employed data triangulation. Triangulation was conducted by comparing information obtained from observations, interviews, and documentation (Jonsen & Jehn, 2009). The researcher also compared perspectives from different participants, particularly teachers and students, to identify areas of convergence and discrepancy. This process was intended to reduce potential researcher bias and strengthen the credibility of the interpretations.

In addition, the researcher maintained systematic documentation throughout the research process, including observation records, interview transcripts, coding results, and relevant supporting documents. Such procedures were employed to ensure that the findings were grounded in the collected evidence and reflected the actual implementation of Technology-Enhanced Learning at MI Nurul Huda.

Ethical Considerations

Ethical principles were observed throughout the research process. Prior to data collection, permission to conduct the study was obtained from the relevant institution (Arifin, 2018). Participants were informed about the purpose and procedures of the research, and their participation was treated confidentially. Particular attention was given to the protection of student participants because they were of elementary-school age. The information collected during the study was used solely for academic and research purposes, and the identities of individual participants were not disclosed in the reporting of the findings.

Results and Discussion

Implementation of Technology-Enhanced Learning at MI Nurul Huda

The findings indicate that Technology-Enhanced Learning (TEL)

has become an increasingly relevant component of the learning process at MI Nurul Huda. The integration of technology was reflected in the use of digital devices and multimedia resources to support the delivery of instructional materials, classroom interaction, and students' learning activities. Rather than replacing conventional teaching practices entirely, technology was primarily utilized as a complementary tool to make learning materials more accessible, interactive, and engaging.

Classroom observations demonstrated that technology-supported activities provided students with opportunities to interact with learning materials through visual, audio, and multimedia content. Such activities appeared to facilitate students' understanding of concepts that might otherwise be difficult to communicate through conventional instructional methods. The use of digital resources also created greater variation in classroom activities, thereby reducing students' dependence on textbook-based learning.

The findings further suggest that the effectiveness of TEL was closely associated with teachers' pedagogical decisions. Technology was most beneficial when it was employed to achieve clearly defined learning objectives rather than being used simply because digital tools were available. Teachers who provided explicit instructions and monitored

students' activities were better able to direct technology use toward meaningful learning. This finding reinforces the view that technology itself does not automatically improve the quality of education. Its educational value depends on the manner in which it is integrated into instructional design.

From a pedagogical perspective, the implementation of TEL at MI Nurul Huda demonstrates a gradual shift from teacher-centered instruction toward more interactive learning practices. Digital resources allowed students to become more actively involved in the learning process, particularly when they were encouraged to explore information, respond to digital materials, or complete technology-supported tasks. However, the findings also reveal that the implementation of TEL should be accompanied by appropriate guidance, particularly because elementary-level students are still developing the cognitive and self-regulatory abilities required to use digital technology effectively.

Development of Students' Digital Competencies

One of the most significant findings concerns the development of students' digital competencies through technology-enhanced learning. The students demonstrated several forms of digital competence, particularly in the basic operation of digital devices, access to digital information,

communication, and the use of digital resources to support learning activities.

The integration of technology provided students with opportunities to develop practical skills through direct experience (Hassan et al., 2015). Instead of learning about technology solely through theoretical explanations, students were able to interact with digital devices and applications as part of their learning activities (Kearsley & Shneiderman, 1998). Repeated exposure to such activities contributed to greater familiarity with basic technological functions and encouraged students to become more independent in completing technology-supported learning tasks.

The findings also indicate that students' digital competence extended beyond technical skills. Through guided digital activities, students were exposed to processes involving information searching, interpretation, selection, and utilization. This is particularly important because digital competence should not be reduced to the ability to operate technological devices. Students also need to understand how information is obtained, assessed, and used appropriately.

Another dimension observed in the learning process was digital communication and collaboration. Technology-supported activities created opportunities for students to communicate with teachers and peers

and to participate in collaborative learning. Such experiences contributed to the development of interpersonal competencies within digital environments. Students were encouraged not only to consume digital content but also to use technology as a medium for interaction and learning.

Nevertheless, the findings suggest that students' digital competencies were not developed uniformly. Differences in students' previous exposure to technology, access to digital devices, and levels of confidence influenced their ability to participate in technology-enhanced learning. Some students appeared to adapt relatively quickly, while others required more direct assistance and repeated instruction. This variation highlights the importance of differentiated support in the development of digital competence at the elementary level.

Students' Engagement in Technology-Enhanced Learning

The findings reveal that technology-enhanced learning generally created a more engaging learning environment. The incorporation of multimedia and interactive digital resources attracted students' attention and encouraged them to participate more actively in classroom activities. Students appeared to demonstrate greater enthusiasm when learning activities incorporated

technological elements that were relevant to the subject matter.

The increased engagement can be understood from both motivational and pedagogical perspectives (Reeve, 2012). Digital media can provide information through multiple modes of representation, including text, images, audio, animation, and video. Such multimodal resources may accommodate different learning preferences and make abstract concepts more accessible to young learners. Consequently, students may perceive learning activities as more interesting and less monotonous.

However, the findings also indicate that increased engagement does not necessarily mean that students automatically engage in meaningful learning. Technology may attract students' attention, but sustained learning requires appropriate instructional direction. Without clear objectives and teacher supervision, students may focus more on the technological features of an activity than on the learning content itself. Therefore, teachers remain essential in transforming technological engagement into productive academic engagement.

This finding emphasizes the distinction between technological engagement and educational engagement. The former concerns students' attraction to and interaction with technology, whereas the latter involves meaningful cognitive

participation in the learning process. Effective TEL should consequently ensure that digital activities encourage students to think, solve problems, communicate ideas, and construct knowledge rather than merely interact with digital devices.

Teachers' Role in Supporting Digital Competency Development

Teachers emerged as a crucial factor in the successful implementation of Technology-Enhanced Learning (Schweighofer et al., 2019). The findings demonstrate that teachers were not merely users of technological tools but also acted as facilitators who guided students in using technology for educational purposes. Their ability to select appropriate digital resources, explain their use, monitor students' activities, and provide feedback influenced the quality of technology-supported learning.

Teacher competence is particularly important at the elementary level because students may possess basic familiarity with technology without fully understanding how to use it productively. Students may know how to operate digital devices for entertainment, but educational technology requires a different set of competencies. Teachers therefore need to establish clear boundaries and learning objectives while simultaneously encouraging students to explore technology independently.

The findings also suggest that teachers need continuous professional development to strengthen their digital and pedagogical competencies. The rapid development of digital technologies means that teachers cannot rely exclusively on their existing technological knowledge. They need opportunities to learn about new digital resources, evaluate their pedagogical relevance, and integrate them appropriately into curriculum objectives.

Thus, the successful implementation of TEL should not be viewed primarily as a technological issue (Laurillard et al., 2009). It is fundamentally a pedagogical issue that requires teachers to combine technological knowledge with subject-matter knowledge and instructional strategies. In this regard, teacher readiness represents one of the key conditions for ensuring that technology contributes meaningfully to students' digital competency development.

Supporting and Inhibiting Factors

The findings identified several factors that influenced the implementation of TEL at MI Nurul Huda. The availability of technological infrastructure represented an important supporting factor. Access to appropriate digital devices, internet connectivity, and relevant learning resources enabled teachers and

students to participate in technology-supported activities more effectively.

In addition to infrastructure, teacher motivation and willingness to integrate technology were important supporting factors. Teachers who demonstrated openness toward technological innovation were more likely to experiment with different forms of digital learning activities. Students' enthusiasm also constituted a positive factor because their interest in technology encouraged active participation in learning.

Nevertheless, several challenges remained. Differences in students' digital abilities constituted one of the main obstacles. Not all students possessed the same level of familiarity with digital technology, meaning that some learners required additional guidance. Infrastructure limitations could also restrict the consistency and variety of technology-enhanced activities (Gulati, 2008). Furthermore, teachers needed to allocate additional time to prepare digital learning materials and manage technology-supported classroom activities.

These challenges demonstrate that the implementation of TEL requires institutional support rather than relying solely on individual teachers. Schools need to provide adequate infrastructure, professional development, technical support, and appropriate policies to ensure sustainable technology integration.

Without such support, the implementation of TEL may remain dependent on individual teacher initiative and may not develop into a consistent educational practice.

Discussion: Technology-Enhanced Learning as a Means of Strengthening Digital Competence

The overall findings suggest that Technology-Enhanced Learning has considerable potential to strengthen students' digital competencies at MI Nurul Huda. The contribution of TEL is particularly evident when students are provided with opportunities to use technology actively and purposefully rather than simply being exposed to digital content.

The findings support the broader conceptualization of digital competence as a multidimensional construct. Students' digital development involves technical proficiency, information literacy, communication, collaboration, content creation, problem-solving, and responsible digital behavior. Therefore, the effectiveness of TEL should be evaluated not only by the frequency with which technology is used but also by the quality of competencies developed through its use.

An important implication of the findings is that technology integration should be aligned with pedagogical objectives. The presence of digital devices in the classroom is insufficient to guarantee the development of digital competence. Meaningful outcomes are

more likely to emerge when students are encouraged to use technology to investigate questions, evaluate information, communicate ideas, collaborate with others, and produce learning outputs.

The findings further indicate that digital competency development at the elementary level requires a balance between technological exploration and teacher guidance. Students need sufficient opportunities to experiment with digital tools, but they also require structured instruction concerning appropriate, ethical, and responsible technology use (Ribble et al., 2004). This is particularly important in an environment where students may encounter large amounts of digital information that are not necessarily appropriate or reliable.

Therefore, TEL at MI Nurul Huda can be understood not simply as the incorporation of technology into existing teaching practices but as an opportunity to cultivate a broader set of competencies required for learning and participation in the digital era. Its long-term effectiveness, however, depends on the alignment of technology, pedagogy, teacher competence, student readiness, and institutional support.

Summary of the Findings

Overall, the study demonstrates that Technology-Enhanced Learning contributes positively to the development of students' digital competencies at MI Nurul Huda. The

integration of technology provides students with opportunities to strengthen their technical abilities, access and process information, communicate and collaborate digitally, and engage more actively in learning. At the same time, the implementation of TEL remains influenced by differences in students' digital readiness, teacher competence, infrastructure, and the availability of appropriate learning resources.

These findings suggest that the development of digital competence should be approached as a continuous educational process rather than as a one-time technological intervention. Schools need to create learning environments in which technology is integrated systematically, teachers receive continuous professional support, and students are gradually guided toward more critical, creative, collaborative, and responsible uses of digital technology. In this way, Technology-Enhanced Learning can function not merely as a means of modernizing classroom instruction but as a strategic approach to preparing students for the demands of contemporary digital society (Wild et al., 2013).

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