DIGITAL INTELLIGENCE: EDUCATION AS THE FOUNDATION FOR DIGITAL INTELLIGENCE

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Abstract

Education is a fundamental pillar in the formation of digital intelligence, a crucial aspect in today's era of rapid technological transformation. When curriculum and teaching methods are integrated with information and communication technologies, students are equipped with the tools and knowledge to adapt, compete and innovate in an increasingly complex and connected society. This study uses the literature research method. The results show that the use of technology in education, in general, has a positive influence on increasing students' learning motivation, concept understanding, and problem-solving skills. Technology integration facilitates more interactive and personalized learning methods, encouraging deeper student engagement in the subject matter. However, the study also revealed that the success of technology integration is highly dependent on device accessibility and connectivity, teacher training and adequate infrastructure support. Inequality of access is one of the main barriers, necessitating specific intervention strategies to bridge the digital divide.

Keywords: Education, technology integration, digital intelligence.

Introduction

The development of information and communication technology (ICT) has led to a major transformation in the way we accomplish our daily tasks and interact with each other. This transformation extends to almost all sectors of life, including education (Sitopu et al., 2024); (Guna et al., 2024); (Hairiyanto et al., 2024). Digital intelligence is an important competency that must be possessed by people in this digital era. Digital

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intelligence includes not only the ability to use technology, but also an understanding of how digital works, ethics, online safety, and the ability to criticize and create meaningful digital content (Aladayleh, 2020).

Digital intelligence is the ability to master and use digital technology, the internet and social media effectively and wisely. It not only includes technical skills in operating digital tools, but also involves a deep understanding of the digital context, online ethics, information security, and creativity in generating and assessing digital content. The focus is on increasing efficiency, productivity and participation in technology-enabled social and professional environments, while maintaining online safety and privacy (Constanzo et al., 2023).

Digital intelligence enables individuals to not only consume digital content, but also to actively and creatively participate in the creation and dissemination of information (Edge, 2020). This is key in shaping responsible and critical citizens, who are able to sort genuine information from hoaxes and have an awareness of the importance of online safety and personal data protection. With these capabilities, one can maximize the potential of technology to enhance learning, work productivity, and expand social networks safely and ethically (Yu & Wang, 2024).

Furthermore, in the context of work, digital intelligence is becoming increasingly important as many industries and sectors have made technology a core part of their operations. Understanding and adapting to the latest digital tools can determine one's future competitiveness and professional relevance (Aiyedun, 2024). In addition, digital intelligence enables individuals to continuously learn and adapt in this fast-paced world, providing the basis for lifelong learning that enables survival and thriving amid constant change. As such, developing digital intelligence is no longer an option, but a necessity, to ensure that every individual can contribute effectively and responsibly in a digital society (Voskoglou, 2023).

Education plays a key role in the formation of digital intelligence, realizing itself as an important issue that cannot be ignored in this digital era. With technology integrated in almost every aspect of life, educational institutions are required to not only teach the traditional basics of literacy and numeracy, but also incorporate digital intelligence learning into their curriculum (Tubagus et al., 2023); (Aslan & Shiong, 2023). The issue revolves around how schools and universities can design learning that prepares students with the necessary skills for navigation of a complex digital world, including responsible use of technology, understanding of online safety, copyright, digital ethics, and development of critical abilities of information found online. Such challenges require skilled educators and adequate learning resources, highlighting the urgency of systemic change in education to ensure that digital intelligence becomes a core component of the teaching and learning process (Badiru & Asaolu, 2023).

This research proposes critical questions on how education can serve as a strong foundation in shaping digital intelligence that is not only robust, but also adaptive to the uncertain changes in the future.

The issue of education in this digital era does not only revolve around the application of ICT in the classroom or the use of gadgets as learning media, but is more complex. The issues include how the curriculum is designed to integrate digital literacy, how teachers are prepared to teach in this highly digital age, and how to ensure that every student is able to access digital learning resources fairly and equitably (Wang, 2022).

This research aims to explore in detail the role of education in shaping digital intelligence and how educational institutions can respond to the challenges that come with the rapid development of digital technologies. It will explore relevant literature to identify methods, strategies and policies that can potentially enhance the formation of digital intelligence in formal education contexts.

Research Methods

The study in this research uses the literature research method. The literature research method is an approach in research conducted by collecting, analyzing, and discussing existing scientific publications, such as journal articles, books, and other reliable sources, which are related to the research topic (Fadli, 2021); (Setiowati, 2016); (Syahran, 2020); (Helaluddin, 2019).

Results and Discussion
Concept of Digital Intelligence

Digital intelligence, often referred to as "DQ," is a collection of competencies required for effective and ethical navigation and use of digital technologies. The concept encompasses various aspects including technical knowledge, cognitive skills, digital ethics, and digital health (Faraon et al., 2023). In the academic literature, DQ is raised as an important key in dealing with challenges from rapid changes in technology. For individuals, having high digital intelligence means they can understand and use digital technologies to solve problems, communicate and collaborate more effectively and responsibly. DQ assessment is useful in developing relevant education and training programs, aiming to improve online safety, ethics, and privacy awareness among internet users (Huang, 2023).

Digital intelligence education is becoming increasingly important to prepare future generations for the complex digital ecosystem. Curricula that integrate digital intelligence learning not only focus on the use of digital tools, but also teach students to understand the social, economic, and ethical impacts of these technologies (Qiao &

Fu, 2023). Schools and learning institutions should approach digital intelligence not simply as an addition to the curriculum, but as an essential part that supports cross-disciplinary learning. This includes developing students' critical thinking about the information they receive and facilitating the development of interpersonal skills in a connected digital landscape. Through this sustainable approach, digital intelligence education has the potential to improve students' adaptability in using new technologies and handling future digital challenges (Al-Nafisa & Alnafessah, 2021).

Digital intelligence (DQ) consists of several important aspects that cover the abilities and skills that individuals need to develop to interact with the digital world effectively and responsibly. These aspects help individuals not only master technology, but also develop wisdom in using technology for the good of individuals and Society (Li, 2022).

First, digital literacy is one of the key components of digital intelligence. Digital literacy involves the ability to search, understand and use information obtained through various digital media. It includes awareness of how search engines work, an understanding of how information is organized online, and skills in evaluating the reliability and credibility of information sources (Matsumura et al., 2022). Digital literacy also includes skills in using software and applications for productive purposes, such as education, work and social interaction.

Second, digital ethics is another important aspect of DQ. Digital ethics is concerned with understanding and applying moral values in an online environment, and includes being responsible in communicating and interacting on the internet. This aspect includes respecting the privacy and rights of others, understanding plagiarism and copyright, and knowledge of netiquette. Developing good digital ethics helps individuals become responsible digital citizens, encouraging positive and constructive interactions in online spaces (Nurdiana et al., 2023).

Third, digital security awareness is a critical component of digital intelligence, referring to the ability to protect personal and sensitive information and keep devices and networks secure. It involves knowledge of different types of digital threats such as malware, phishing and hacking. Digital security awareness also includes practices such as the use of strong passwords, proper privacy settings on apps and services, and careful use of internet connectivity. Developing security awareness helps individuals reduce the risk of personal and financial information compromise and forms the basis for safe and secure online behavior (Tao et al., 2022).

These three aspects - digital literacy, digital ethics and digital security awareness - are interrelated and together form the basis for comprehensive DQ development. By mastering each of these aspects, individuals can not only utilize technology for personal and professional benefits but also contribute to a safer, more inclusive and ethical digital environment.

Education and Digital Intelligence

Education plays a key role in shaping digital intelligence (DQ) in society. In an era where digital technology is increasingly integrated in all aspects of life, education should not only focus on the transfer of academic knowledge but should also make DQ development one of its main objectives (Kwon & Lee, 2024). This can be done by incorporating curricula covering digital literacy, digital ethics, and digital security awareness into formal education from elementary school to higher education. In this way, students not only learn to use technology but also understand the context, consequences and responsibilities that come with such use (Haddar et al., 2023); (Tuhuteru et al., 2023). Through continuous learning, teachers can help students develop a critical attitude towards information encountered online, teach them to identify fake news and scams, and provide them with tools to protect themselves from cybersecurity risks (Omelnytskyi, 2023).

In addition, education on digital intelligence should go beyond standard subject matter and facilitate more practical and contextualized learning experiences. This means that educational institutions should provide resources, such as up-to-date technological facilities and opportunities to learn through digitally-based projects or collaborations, which allow students to apply their digital knowledge in real-world situations (Trgalová, 2022). By engaging students in initiatives that encourage the safe and ethical use of technology, young people will be better equipped to contribute positively in the digital community and future professionals. Initiatives such as project-based learning, group discussions on online ethics cases, and activities that teach skills to navigate privacy and security settings, can provide students with hands-on experience in dealing with the challenges facing contemporary digital users (Hammoda, 2023).

Learning models that support the development of digital intelligence should be adaptive and thorough, facilitating not only knowledge acquisition but also practical application of digital skills. One effective approach is the flipped classroom model, where students study material at home through videos or digital reading materials and then use class time to work on assignments and projects that require critical thinking, collaboration and practical application of what they have learned (Verbato, 2023). This approach allows teachers to take on more of a facilitator and mentor role, providing individualized assistance and supporting in-depth discussions on ethics and safety in technology use. In addition, this model encourages students to become more independent learners and skilled in finding and managing digital information (Alnaser et al., 2023).

Furthermore, project-based learning (PBL) is another model that strongly supports the development of digital intelligence. In this model, students are assigned to work on complex and often multidisciplinary projects, which require research, cooperation and creative solutions. Such projects can range from app development to

solve specific problems, to digital campaigns to raise awareness about social issues. PBL not only improves digital literacy and technical expertise, but also develops soft skills such as teamwork, communication, and problem-solving. In addition, PBL deepens students' understanding of social and ethical responsibilities in their digital world (Widjaja & Aslan, 2022).

Finally, the integration of technology in every aspect of the curriculum can strengthen the teaching and learning of digital intelligence naturally without having to make it a separate subject. This can include the use of ICT tools in all subjects, not just in computer or technology lessons. For example, the use of blogs for language writing, social platforms for geography class cooperative projects, or the use of digital simulation tools in science lessons (NICOLA-GAVRILĂ, 2023). An integrated approach helps students understand and appreciate the interconnections between technology and everyday life, and trains them to use technology ethically and responsibly. It also provides more opportunities for teachers to explore and create lessons that capture students' attention and are relevant to the latest technological developments (Sharma, 2024).

Thus, the development of digital intelligence in education requires adaptive and applicable approaches to integrate essential digital skills, knowledge and attitudes for students. Learning models such as the flipped classroom and project-based learning (PBL) help support this by promoting the independent, critical and collaborative learning required to meet the challenges and opportunities of the digital age. In addition, the thorough integration of technology in the curriculum helps students realize the importance of technology in all aspects of life and teaches them to use technology responsibly and ethically. Thus, effective digital intelligence education not only strengthens digital literacy but also shapes students' characters to become competent and responsible participants in today's global digital society.

Challenges in Implementing Digital Education

The integration of digital technology in education certainly faces a number of barriers and issues. One of the main barriers is the lack of adequate technology infrastructure and access, especially in remote or less developed areas. Without access to technological devices such as computers or stable internet, students and teachers will struggle to keep up with digital-based learning methodologies. This creates a digital divide where students coming from less affluent backgrounds do not get the same benefits from digital education as their peers in more developed areas (Strohmier et al., 2024).

Another challenge is the lack of teacher training and expertise in using educational technology. Many teachers may not have sufficient digital skills to integrate technology into their curriculum effectively (ORAK & ALAGÖZLÜ, 2023). This leads to suboptimal use of technology in learning, which can result in an ineffective learning

experience for students. Adequate training for teachers is essential to ensure that technology is integrated not just as an additional tool, but as an integral part of the teaching and learning process (Zhang, 2021).

Finally, there are also data security and privacy issues that may arise with the use of technology in education. Schools and institutions must take great care in protecting students' personal information stored and accessed through digital systems. Without strong security policies and protocols, sensitive data could be at risk of exposure or misuse. In response to this, education on cyber security and privacy should be part of the curriculum, not only to protect data but also to equip students with the knowledge to protect themselves in the digital space (Haryono & Mansur, 2023); (Li, 2022).

In conclusion, while the integration of digital technologies in education opens up many opportunities for innovation in the teaching and learning process, there are a number of barriers and issues that need to be seriously addressed. Gaps in access to technology, lack of digital expertise among teachers, and issues of data security and privacy all require comprehensive and collaborative solutions from the various parties involved in the education system. Addressing these issues is critical to ensuring that digital integration in education is effective, equitable and safe, so that all students can benefit from digital learning regardless of their background or circumstances.

Digital Intelligence Development Strategy

Strategies for developing digital intelligence in education can begin with building a strong digital infrastructure. This includes providing adequate hardware such as computers, tablets and fast Internet access as well as applicable software to support the learning process. Investments in this infrastructure should be made inclusively, ensuring that every student, regardless of economic background or geographical location, has equal access (Heath & Parrish, 2020). Additionally, education on the safe and responsible use of technology should be a central part of digital education (Reid, 2020).

Teacher professional development in digital intelligence is also key. Continuous training and development programs should be implemented to improve educators' digital competencies. This includes not only technical training but also enriching teachers' vision on how to integrate technology in the curriculum to improve educational outcomes. Collaboration with technology and e-learning experts can help in designing interactive and engaging learning materials for students, fostering curiosity and problem-solving skills through project-based approaches and experiments (Astuti et al., 2023).

Finally, the implementation of policies that support digital intelligence, including data protection and cyber security, should be emphasized to ensure that best practices are followed. The education system should equip students with knowledge about their rights and responsibilities as internet users, as well as ways to protect themselves from

digital threats (Otieno, 2020). Developing a curriculum that covers the ethical, legal and social aspects of technology is also important so that students not only become skilled users but also responsible and critical of the technology they use (Sharma, 2024).

In conclusion, strategies for developing digital intelligence in education involve a comprehensive set of efforts that include building technological infrastructure, improving teachers' digital competencies, and implementing policies that support safe and responsible digital practices. This holistic approach aims not only to equip students with technical skills, but also to shape critical thinking, readiness to face future challenges, and ethical understanding of technology use. The ultimate expectation is to create a learning environment that is not only inclusive and equitable for all learners, but also conducive to the responsible and sustainable development of digital intelligence.

Conclusion

The utilization of digital technology in the learning process plays an important role in improving the effectiveness of education. Technology, when used in the right way, can enrich the learning experience through more interactive and engaging teaching materials, as well as provide students with access to extensive and diverse learning resources. This creates a more dynamic and flexible learning environment where students can learn at their own pace and learning style. Meanwhile, data from the review also emphasized the importance of preparing teachers with the necessary skills and tools to effectively integrate technology into their curriculum.

However, the results also identified some significant challenges, including inequalities in access to technology and internet connectivity that may hinder learning opportunities for some students. In addition, there are concerns related to the adequacy of training for teachers in utilizing technology, as well as the need for better strategies in assessing and ensuring the quality of digital learning. This points to the need for greater investment in education technology infrastructure and teacher professional development for technology to be fully utilized in education.

Overall, the results underscore that technology integration in education offers significant opportunities to improve learning, but also requires careful planning and implementation to overcome existing barriers. This includes efforts to reduce access gaps, improve teacher training and develop assessment methodologies that can accommodate digital learning. In order to optimize the potential of technology in education, a holistic and collaborative approach from various parties, including educational institutions, government, and the private sector, is essential.

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