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DIGITAL SAVVY: BUILDING DIGITAL INTELLIGENCE IN 21ST CENTURY EDUCATION

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Abstract

The development of digital intelligence in education is an area that continues to receive academic and practical attention amid rapid technological advances. This research aims to analyze and synthesize the results of recent studies on digital intelligence implementation strategies in the school environment and the challenges faced. By using the literature research method in accordance with the theory of the research context. The results show that unequal access to technological resources, deficiencies in educator training on educational technology, and disparities in digital skills among teachers are the main challenges in integrating digital intelligence in schools. Our findings also emphasize the need for strong technology infrastructure development, comprehensive teacher training programs, and collaborative learning initiatives among teachers to overcome these barriers.

Keywords: Digital Savvy, Digital Intelligence, 21st Century Education.

Introduction

In the era of globalization and industrial revolution 4.0, information and communication technology (ICT) is developing very rapidly. ICT has changed many aspects of human life, including the education sector. The digital era brings significant changes to the way we work, communicate and learn (Carabregu-Vokshi et al., 2023). In this context, the concept of "Digital Savvy" emerged as one of the fundamental needs

that every individual, especially the younger generation, must have in order to adapt and succeed in the 21st century (Skloot, 2023).

ICT, which includes the use of the internet, social media, smart devices, and other digital applications, has facilitated wider access to information and more dynamic interactions between individuals around the world (Julita & Zulyusri, 2023). These changes not only create new opportunities but also demand adaptation to new digital skills and ways of thinking. This trend shows that the ability to understand, adapt and utilize digital technology is no longer an option but has become a fundamental need for every individual to be able to participate effectively in an ever-evolving global society and economy (Kaneria & Mehta, 2024).

Education, as one of the main pillars in character building and individual competence, should be able to adapt to the needs of the times (Kaneria & Mehta, 2024). Recognizing this, there is an urgent need to include and emphasize the development of digital intelligence in the education curriculum. Digital intelligence is not just about the ability to use devices and technology, but more broadly includes a critical understanding of digital media, awareness of privacy and security issues, and the ability to create and communicate effectively through digital platforms (Healy & Kennedy, 2023).

Digital intelligence has become an important key influencing individual success in life and work in the 21st century, an era characterized by the dominance of digital technologies. It encompasses more than just understanding how digital devices work; it encapsulates media literacy, cybersecurity awareness, an understanding of digital ethics, and the ability to utilize digital media to create and communicate information effectively (Rahimi, 2023). In the workplace, digital intelligence enables individuals to work more efficiently through the use of digital tools, facilitate collaboration with colleagues from different locations through communication technologies, and enhance the ability to solve complex problems with innovative approaches (Torgler, 2023).

On the other hand, in aspects of daily life, digital intelligence contributes to an individual's ability to access information, learn independently, interact with others, and participate in social activities in a more meaningful way (Torgler, 2023). With the internet now the main source of information for many people, the ability to sort and verify accurate information is necessary to avoid information missions and hoaxes (Sitopu et al., 2024); (Guna et al., 2024). In addition, digital skills help individuals to take advantage of opportunities provided by the digital economy, such as e-commerce and freelancing. Without digital intelligence, individuals risk falling behind the times, both professionally and personally, given the increasingly integral role of digital technologies in various aspects of life (Sreelakshmi & Anoop, 2023).

However, the challenge is how to design and implement education that is able to meet the needs of developing digital intelligence. Many educational institutions are still implementing traditional curricula that provide less space for the development of digital skills and competencies (Hairiyanto et al., 2024); (Reikosky, 2023).

In an increasingly complex and technology-influenced society, educational curricula need to be urgently adjusted to meet the pressing needs of digital skills (Tubagus et al., 2023); (Aslan & Shiong, 2023). It is no longer enough for curricula to focus on traditional academic knowledge; skills such as programming, computational thinking, graphic design and data management must be included as core elements of education. The focus on digital literacy and media literacy should also be strengthened, providing students with the necessary tools to think critically about the information they receive and produce. Moreover, the curriculum should inspire creativity and innovation, making students not only passive consumers of information but also active and ethical producers of content in the digital ecosystem (Lobzhanidze et al., 2023); (Mun et al., 2023).

The transition to a curriculum that integrates digital skills makes it imperative that educators are able to teach these concepts and skills. Teachers need to be armed with adequate training and resources to maintain their knowledge of fast-evolving technologies. This creates challenges for the education system in developing ongoing professional development programs, as well as effective in-service curricula (Nurdiana et al., 2023). Institutional support is also vital, including adequate IT infrastructure, access to cutting-edge learning tools, and a learning environment that motivates students to explore and improve their digital skills (Sarmila et al., 2023). A multi-disciplinary approach, which combines technology lessons with other subjects, can better embed an integrated understanding of how technology is applied in a broader context. In addition, there are challenges in preparing competent educators to teach and facilitate learning in digital contexts (Mun et al., 2023).

Therefore, this research aims to explore and examine how 21st century education can build digital intelligence in learners. The main focus is to understand the essential components of digital intelligence and identify strategies, methods and best practices that can be applied in education to prepare students to become digitally proficient individuals. It is hoped that this research will provide insights and recommendations for policy makers, education practitioners, and the academic community in designing and implementing education that is relevant to current and future needs.

Research Methods

The study in this research method uses a literature review. The literature research method is one of the important approaches in academia to investigate and analyze a particular topic by relying on existing written sources (Sio et al., 2024). In this context, "literature" can refer to various types of texts, including books, scientific journals, conference papers, and theses, all of which are used as a basis for building new understanding or reinterpreting existing information and data (Nguyen et al., 2024). This process involves searching for relevant keywords in catalogs, indexes, and search

engines to collect references relevant to the research topic. This is a literature study method that allows researchers to find other references from various reliable sources. Thus, through this method, researchers can conduct in-depth data synthesis to construct a strong argument or theoretical framework based on existing literature (Kim et al., 2024).

Results and Discussion

Digital Savvy and Digital Intelligence

"Digital Savvy" refers to a person's ability to use digital technologies and social media intuitively and efficiently. Digitally savvy individuals are not only proficient in operating digital devices and current applications, but they also have a deep understanding of how digital media operate in social, economic, and personal contexts (Carabregu-Vokshi et al., 2023). They can navigate, assess, and utilize information from the internet critically, use digital tools to solve everyday problems, communicate ideas effectively, and build professional and social networks. Characteristics of digital savvy include quick adaptation to new technologies, an understanding of online security and privacy, and the ability to distinguish between credible and non-credible sources of information (Skloot, 2023).

Meanwhile, "Digital Intelligence" is a broader concept that encompasses a person's knowledge, skills and attitudes in using digital technologies in ethical, responsible and effective ways. These aspects include digital literacy, digital ethics, digital safety, and rights and responsibilities in the digital world. Digital intelligence is not only about having the technical skills to use digital tools, but also about understanding the social and cultural impacts of those technologies, as well as being able to participate positively and productively in a digital society (Julita & Zulyusri, 2023). In other words, digital intelligence combines technical ability with critical thinking, social empathy, and ethical awareness, allowing individuals to not only survive but thrive in the ever-changing digital age (Kaneria & Mehta, 2024).

The importance of digital intelligence in the current era cannot be underestimated, as almost all aspects of life are now embedded in digital technology. Work environments, education, interpersonal communication, and financial transactions are now digitized. Therefore, having digital intelligence is not an option but a necessity to ensure that individuals can interact in the digital world safely and effectively. Skills in navigating online privacy, recognizing and preventing cyberbullying, and understanding intellectual property rights in the digital context are some examples of important aspects of digital intelligence that must be mastered (Healy & Kennedy, 2023). Furthermore, digital intelligence also helps in making informed and responsible decisions when sharing or consuming content on digital media, a crucial skill in today's 'infodemic' age (Rahimi, 2023).

On the other hand, digital upskilling also supports career advancement and personal development. In the workplace, digitally intelligent employees tend to be more adaptive in the face of technological change and more efficient in their work. At home or in personal life, digitally intelligent individuals are able to use technology to enrich their family and social lives in a safe and ethical manner (Torgler, 2023). Therefore, digital intelligence education and training should be a priority in schools and workplaces to ensure that every individual is equipped with sufficient understanding to face and utilize this ever-evolving digital world.

21st Century Education Concept

21st century education emphasizes the need to develop competencies and skills relevant to the demands of the times, which are often summarized in four main Cs: Critical thinking, Communication, Collaboration, and Creativity (Sreelakshmi & Anoop, 2023). The focus is no longer just on the memorization of facts and data, but rather on how students can analyze information, think critically, solve complex problems, and cooperate with others in a fast-paced and ever-changing environment. It also involves the integration of technology in learning, not only as a learning tool but also as a means to prepare students for an increasingly digital work environment. Adaptability, media and information literacy, and social and cultural awareness are also important parts of the 21st century education curriculum (Reikosky, 2023).

In addition to the four Cs, 21st century education also introduces concepts such as personalized learning, where teaching approaches are tailored to students' individual needs and abilities, and recognizes that each student has a different learning pace and learning style. Project-based and inquiry learning are becoming more common, where students engage in projects that demand creative and collaborative thinking to solve real-world problems. The importance of character development and global citizenship education also stands out, as an increasingly connected world requires individuals who are not only academically intelligent but also have empathy and concern for global issues such as inequality, climate change and sustainability (Lobzhanidze et al., 2023). In this context, education is no longer just about career preparation but also character building and building a responsible global identity.

In preparing students for this unpredictable future, 21st century education also pays attention to an interdisciplinary approach to learning. This means going beyond traditional subject boundaries and encouraging students to see the connections between different disciplines, such as incorporating science, technology, engineering, arts and math (STEAM) to support holistic and innovative thinking (Mun et al., 2023). This helps students understand the complexity of the world around them and encourages them to apply their knowledge and skills in a wide and varied context. In addition, character education and social-emotional learning are integrated to support

the formation of students' identities as individuals who are empathetic and prepared for future personal and professional challenges (Lopez-Jimenez, 2023).

Thus, 21st century education is about preparing students not only with knowledge, but with the skills and values necessary to succeed and contribute positively in an ever-changing world. Key to this modern education is flexibility in teaching approaches, adaptation to technology, and the cultivation of vital life skills such as critical thinking, creativity, collaboration, and communication (Xiao, 2024). Education must constantly innovate and adapt to be relevant to future needs, educating not only competent workers but also responsible and informed global citizens. As such, education becomes a driving force for individual development, as well as social and economic progress at large.

Digital Skills Required in the Future

In today's digital age, digital skills are becoming increasingly important due to the increasingly dominant role of technology in almost all aspects of daily life and the work environment. Therefore, being prepared with strong digital skills not only improves one's career prospects, but also ensures that they are able to participate effectively and critically in an ever-evolving society (Haddar et al., 2023). The digital skills required in the future include data literacy, which involves the ability to collect, interpret and analyze data effectively. In addition, an understanding of cybersecurity and data privacy is crucial to protect sensitive information (Tuhuteru et al., 2023). Coding and programming skills are also increasingly valued, not only in the tech industry but also in various other sectors that are increasingly integrating digital solutions in their operations (Karakunnel, 2023).

Furthermore, skills in artificial intelligence (AI) and machine learning are starting to become essential, as they play a growing role in the development of new products and services (UÇAR, 2023). Skills in cloud computing, database management and big data analysis also offer a competitive advantage in the job market. In addition, digital creativity, which includes graphic design, video editing and interactive content development, is becoming increasingly important in a world that places great emphasis on visual and digital communication. Preparing for these skills will not only open up vast career opportunities but also enable one to contribute significantly to technological innovation and advancement (Dhakal, 2023).

Understanding the importance of adapting to the latest technology, digital skills also include the ability to learn and adapt continuously to technological changes. This skill is known as “lifelong learning” (Skinner et al., 2023). In a rapidly changing world, the ability to independently learn new technologies, master digital platforms and tools, and keep up with current trends is key to staying relevant in the job market. In addition, online collaboration and digital project management are becoming important parts of

digital skills, as geographically dispersed teams increasingly work and projects are managed virtually (Ufondu et al., 2023).

In the future, digital skills will become more than just an option; they will be an absolute requirement in various career fields and everyday life. Data literacy, an understanding of cybersecurity, programming ability, and proficiency in AI and machine learning are just a few examples of the skills required (Walimbwa, 2023). Coupled with adaptability, creative problem-solving and digital collaboration, a thorough digital skills preparation is at the core of enhancing competitiveness and active participation in an increasingly technology-dominated global economy. Educating oneself and future generations in these skills not only prepares individuals for the jobs of the future but also ensures that they can contribute to innovative solutions to the global challenges we face (Asli, 2023).

Learning Strategies: Effective ways to integrate technology in curriculum and learning

Integrating technology into the curriculum and learning process requires innovative and effective strategies to maximize its benefits for students. One effective way is through the flipped classroom model, where students study learning materials at home through videos, podcasts or other online materials, and class time is used for in-depth discussions, group activities and hands-on practice (Durgun, 2023). This approach allows students to learn at their own pace before applying their understanding in a more collaborative classroom situation. In addition, the utilization of online learning platforms and educational apps can facilitate independent learning and collaboration between students. These platforms offer a variety of resources, such as interactive tutorials, quizzes and games that can tailor to each student's learning needs, encouraging more personalized and active learning (Rasdiana et al., 2024).

It is also important to train teachers in the utilization of learning technologies, as the success of technology integration largely depends on teachers' ability to use them effectively in the classroom. Professional training focusing on digital pedagogy and the latest educational tools can equip teachers with the necessary skills and knowledge to design and implement engaging and meaningful learning (Haipinge & Goosen, 2024). Utilizing social media and blogs as learning tools can also be an innovative way to integrate technology, allowing students to share and collaborate on projects or discuss specific topics online. By ensuring that the use of technology matches the learning objectives and engages students in an interactive process, teachers can create a learning environment that is rich in resources and inspires students to explore and develop their interests further (Ganguli, 2024).

Furthermore, it is important to implement a project-based approach in a technology-integrated curriculum. It allows students to work on real problems and develop creative solutions using relevant digital tools, software and platforms (Gisore, 2023). This learning model not only enhances students' understanding of technology in

a practical context, but also develops important skills such as teamwork, communication, and critical thinking. Teachers can use digital project management tools to help students monitor their progress, collaborate efficiently, and share their final results with a wider audience, such as through online presentations or publications on the web. Formative assessment using technology, such as instant online quizzes and feedback through digital tools, can also be used to provide timely feedback and help students understand areas that require improvement (BAHŞİ, 2023).

Thus, the integration of technology in learning and curriculum involves a holistic approach and creative thinking to create a conducive environment for students to learn and develop. Utilizing technology in flipped learning models, teacher training, project-based learning, and digital formative assessment are strategies that can change the way learning becomes more interactive, personalized, and provide students with skills relevant to 21st century needs. By combining direct instruction with dynamic and innovative technology, we can enrich the learning experience, strengthen student engagement, and prepare them for success in an increasingly digitized future.

The Role of Educators: Transforming the role of teachers from information deliverers to facilitators in building digital intelligence

In today's digital era, the role of the teacher has undergone a significant transformation from being a conveyor of information to a facilitator of learning. In the midst of rapid technological development, information can be accessed easily and quickly by students through the internet (Aslan & Pong, 2023). Therefore, the task of teachers is no longer just teaching facts or concepts, but rather guiding students how to navigate and critically assess information, as well as use technology ethically and effectively. Teachers become mentors who support students in building their digital intelligence, teaching them to think critically about the content they find online, understand privacy and security issues, and use social media and other digital tools in productive and responsible ways (Mononen, 2024).

Furthermore, in their role as facilitators, teachers must be able to integrate technology in daily learning not only as a tool, but as an integral part of the curriculum that supports collaborative and project-based learning. This requires a renewal in teaching methods, where teachers should familiarize themselves with using digital platforms and collaboration tools, and encourage students to use technology not only for information consumption, but rather for creative and innovative content creation (ATAR & BAĞCI, 2023). As such, this approach helps students develop abilities such as problem solving, critical thinking, and teamwork, all of which are essential components of digital intelligence in the 21st century.

Going a step further, educators need to introduce the concept of digital citizenship to students, teaching them about responsibility and ethics in the digital world. This includes respecting copyright, understanding the importance of maintaining online privacy, and building awareness about the impact of their digital interactions on others (ÖZEREN, 2023). Building digital intelligence also requires teachers to play an active role in identifying and integrating the latest digital tools that can support learning activities, ensuring they are safe and appropriate for classroom use. Through these efforts, teachers not only teach subject matter, but also prepare students to navigate the ever-evolving digital environment confidently and safely (Widjaja & Aslan, 2022).

Thus, the role of educators in the digital age has fundamentally transformed. With the development of technology, teachers are no longer the primary source of information, but rather key facilitators in students' learning process, helping them develop digital intelligence. Through innovative learning approaches and the use of digital tools, teachers can prepare students not only with knowledge, but with critical skills to navigate the digital world. Building digital intelligence among students not only requires them to be competent users of technology, but also responsible and ethical digital citizens. As educators, preparing students with the ability and knowledge to succeed in this increasingly connected society is an important and urgent responsibility that must be taken seriously.

Challenges: Barriers to implementing digitally-enabled learning and strategies to overcome them

One of the main challenges in implementing digital-enabled learning is inequitable access to technology and internet infrastructure. Students in remote or underprivileged areas may not have equal access to digital devices or stable internet connections, which limits their ability to participate in digital-based learning activities. In addition, the lack of training for teachers in the utilization of educational technology is also a major barrier (Astuti et al., 2023). Many educators may not feel confident in using new digital tools or feel overwhelmed by the pace of technological change. This can hinder the effective integration of technology in learning and the building of students' digital intelligence (Demchenko et al., 2023).

To address this challenge, one strategy that can be implemented is to increase investment in technology and education infrastructure in underserved areas, ensuring all students have equal access to digital learning resources. Governments and educational institutions can work together to provide devices and internet access to students who need it. Furthermore, providing training and resources for teachers to develop skills in educational technology is another important step (Nafees & Gouri, 2023). Continuous professional development programs can help teachers acquire the necessary skills to integrate technology in learning effectively and creatively, so they

can be more confident and efficient in facilitating learning that supports digital intelligence (Flisfeder, 2023).

Addressing the skills gap between teachers is another challenge that needs to be addressed. In some schools, there may be significant variations in teachers' ability and comfort in using technology for learning. Teachers who are older or less familiar with technology may find it difficult to adapt to new learning methods that rely on the use of digital tools (Dedaj, 2024). This can create inconsistencies in students' learning experiences, where some classes may be more advanced in their use of technology than others. To address this, schools can organize mentoring and collaboration sessions between teachers, where teachers who are more proficient in technology can share their knowledge and strategies with less experienced colleagues (Gallon, 2024). Approaches such as communities of practice can strengthen collaboration between teachers and facilitate knowledge exchange that is beneficial to all members (Arnadi et al., 2021).

Thus, building digital intelligence in the school environment is not an easy task and faces various obstacles; however, with the right strategies, these challenges can be overcome. Through investments in infrastructure, teacher training, and building collaborative communities among teaching staff, schools can create learning environments that are inclusive and support all students in their digital skills development. The implementation of policies and programs designed to support equitable access to technology and resources, as well as improve teachers' digital competencies, is critical in responding to today's learning needs. In the digital age, where digital skills are becoming increasingly important, preparing students with digital intelligence is not just about teaching them to use technology, but also about preparing them to become critical thinkers, lifelong learners and responsible digital citizens.

Conclusion

Digital intelligence is a critical aspect of education that involves not only using technology, but also developing students' ability to be critical and ethical in using digital information. Findings show that unequal access to technology, lack of training for teachers in the use of digital tools and differences in digital skills between teachers are major barriers to implementing learning that supports digital intelligence. Therefore, it is important for educational institutions to address these challenges with comprehensive strategies so that all students can acquire the necessary skills to succeed in the digital age.

Recommendations for implementation of education policies and practices include increased investment in technology and education infrastructure, particularly in underserved areas, to ensure equitable access to digital learning resources. In addition, professional development for teachers should be prioritized, with a focus on training in educational technology to improve their ability to integrate digital tools into learning.

Increased collaboration among teachers through mentoring and communities of practice can also strengthen the development of digital intelligence in the school environment. The implementation of this approach will strengthen the position of education in facing the challenges of the digital age and equip students with the necessary skills to become competent and responsible digital citizens.

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