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EDUCATIONAL TRANSFORMATION: STRENGTHENING THE FOUNDATION OF DIGITAL INTELLIGENCE IN THE EDUCATION SYSTEM

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Abstract

Digital transformation has touched almost every aspect of life, including the education sector. The implementation of digital technology in learning opens up new opportunities to create a more adaptive and inclusive educational environment. This study aims to explore the impact of digital transformation on education, focusing on accessibility, personalization of learning, and skills development for the 21st century. The research method used in this study is the literature research method. The results show that access to education is significantly improved by digital learning resources, especially for individuals in remote areas and those facing economic barriers. Personalization of learning through data analytics and AI shows improvement in learning motivation and retention of material, resulting in more effective learning outputs. Furthermore, the introduction to digital technologies in the learning process has prepared students with skills essential for success in the modern workplace, including virtual collaboration, critical thinking, and problem-solving.

Keywords: Educational Transformation, Digital Intelligence, Education System.

Introduction

The world is currently experiencing a large and rapid shift due to the digital revolution. This revolution has a significant impact on various aspects of life, including in the Education sector (Iswadi et al., 2022); (ALLAHYAROVA, 2022). Digital intelligence is no longer an option but a necessity, where students need to be equipped with ways of thinking and skills relevant to a connected and data-enriched world (Alnajim, 2023).

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Learning processes must accommodate real digital interactions and prepare future generations with competencies such as data literacy, cybersecurity, programming, and critical analysis of information (Alshammari, 2023). Therefore, digital transformation of education is imperative to ensure that individuals are able to contribute to and compete effectively in a global economy dominated by rapid innovation and change (Maryam, S. 2024; Sanusi et al., 2024).

As the foundation of character building and human resource intelligence, education cannot be separated from the influence of digital transformation, which requires the integration of digital intelligence in the curriculum and teaching methodology (Hairiyanto et al., 2024); (Arnadi et al., 2021). Education that is unable to adapt its curriculum and methodology to encompass this digital intelligence risks producing graduates who are ill-prepared to face the challenges of the new world of work, where digital skills are a core part of the job specifications (Argüelles-Cruz et al., 2021).

Given the importance of technology in all sectors, including the economy, health, and even in aspects of daily life, education must evolve from a focus on theoretical knowledge to an understanding of practical applications that can be utilized immediately (Ayantaş & Hallaç, 2024). This not only ensures the relevance of education to the modern world but also encourages lifelong learning which continues to be necessary in a rapidly changing environment (Bakhtiiarova, 2023). This transformation requires educators to constantly update their knowledge of technology and adopt a more collaborative, interactive way of teaching accompanied by the effective use of digital tools, thus instilling a strong foundation for students to enter the real professional world, where rapid adjustment to technological developments is a must-have skill (Benavides et al., 2021).

Digital intelligence is a combination of technological capabilities, digital skills, digital ethics, critical thinking, and other capabilities relevant to the use of technology (Hosaini, H., & Muslimin, M. 2024). Transformation of the education system is crucial to prepare students not only for a technologically changing world but also to provide graduates with the ability to compete and adapt in the digital age (Boatman & Borowiec, 2022).

Education in the age of digital intelligence demands a change in the approach to teaching, learning and the curriculum offered by educational institutions. It is not just about using digital tools, but also understanding how to learn effectively through technology, developing digital thinking skills, such as programming, data analysis, and cybersecurity, and implementing ethics and integrity policies in cyberspace (Aslan, 2022); (Burgos & Branch, 2021).

While support for the integration of digital technologies in education shows many advantages, there are still challenges that need to be overcome. Some of these include the existing digital divide, where access to devices and connectivity is unequal

among students, and the lack of training for educators in utilizing technology for teaching (Castillo et al., 2021).

On the other hand, educators may also face barriers in understanding and implementing new digital tools into their established teaching strategies. This has become even more apparent with the advent of the COVID-19 pandemic, which has required an abrupt shift from traditional classrooms to remote teaching, exposing gaps in current educational capacity and infrastructure to cope with the demands of digitization (Cervantes & Zapata-Jaramillo, 2021); (Cheng & Wang, 2023).

This backdrop provides ample room for strengthening the foundation of digital intelligence in the education system, implementing strategies to overcome barriers, and providing opportunities for students to become future-ready workers with the appropriate tools and skills. This research aims to review literature that will answer how the current education system can adapt to these new demands and what steps can be taken to strengthen educational transformation in the context of digital intelligence.

Research Methods

The study conducted in this research uses the literature research method. The literature research method is a research approach based on analyzing written sources, including books, journal articles, online documents, and other published materials, to gather information, understand phenomena, or build new arguments on a particular topic. (Nguyen et al., 2024); (Wekke, 2020).

Results and Discussion

Digital Intelligence Theory

Digital intelligence refers to the set of abilities required to effectively use digital resources, communication tools or networks to find, analyze, create and communicate necessary information (Cheng & Wang, 2023). It includes technical expertise such as an understanding of how hardware and software work, as well as the cognitive ability to analyze and critically evaluate information. In addition, digital intelligence also involves ethics and social awareness in using internet technologies and social media, which means understanding the social and ethical implications of digital interactions and maintaining the privacy and security of personal and others' information (Cortés et al., 2021).

Dimensions of digital intelligence generally include digital literacy, digital communication, digital ethics and digital safety. Digital literacy refers to the ability to search for, understand and assess information from various digital sources. Digital communication is the ability to use technological tools to interact and communicate with others effectively (Dei, 2021). Digital ethics relates to the understanding and application of ethics and responsible behavior online, including the use of content in a

way that respects copyright and individual privacy (Djavanshir, 2022). Finally, digital safety emphasizes understanding the security risks in the digital environment and taking the necessary actions to protect personal information and devices from threats such as malware or hacking. The combination of these dimensions forms the basis for operating consciously and effectively in a digital space that is increasingly becoming an important part of everyday life (Durst, 2023).

In the context of education, digital intelligence offers significant benefits in facilitating more interactive, efficient and personalized learning. By integrating digital technologies into teaching and learning, teachers and students can access extensive educational resources, such as interactive teaching materials, learning videos and collaborative platforms, which enable more dynamic and engaging learning experiences. Digital intelligence also promotes the development of essential 21st century skills such as critical thinking, creativity and the ability to collaborate effectively in online environments (Egloffstein & Ifenthaler, 2021). In addition, mastery of digital technologies opens up opportunities for students to learn according to their own pace and learning style, providing additional support for those who need it and more challenges for those who are advanced. Thus, digital intelligence not only improves the quality of education but also prepares students with the necessary skills to succeed in a global economy increasingly dominated by technology (Elkordy & Iovinelli, 2021).

Education Transformation Model

Technology has brought a wave of innovation in education, creating new learning models that revolutionize the way material is taught and learned. One innovative model is the "flipped classroom", where students are introduced to learning materials at home through video lectures or online materials, and class time is used for interactive discussions, problem solving, and activities that deepen understanding (Esera & Niupulusu, 2023). This model leverages technology to move the transmission of information outside the classroom, allowing teachers to focus their time on the application and internalization of knowledge by students in a collaborative setting. This facilitates a student-centric approach to learning, where students are actively involved in their own learning process, and the teacher acts as a facilitator or mentor (Evenko & Glivenkova, 2024).

Another prominent model is project-based learning (PBL) that integrates with technology. In this model, students work in groups on complex, multidisciplinary projects, often solving real-world problems or answering big questions, using technology tools for research, collaboration and presentation of their work (Gama et al., 2020). Technology expands the scope and depth of resources available to students, allowing them to access up-to-date information, interact with experts in the field through social media or other collaborative platforms, and use digital tools to create their products or solutions (Geada, 2022). This technology-supported PBL model not

only increases student engagement and develops skills relevant to the 21st century, such as critical thinking, teamwork, and information literacy, but also prepares them for success in an increasingly technology-dependent professional ecosystem (Gelfman, 2022).

Furthermore, the use of technology in education opens up new insights into adaptive learning, where learning platforms can customize learning materials in real-time based on students' understanding and learning pace. Adaptive learning technology uses advanced algorithms to analyze students' performance and learning preferences, providing customized learning materials to meet their individual needs (Ghosal, 2023). This ensures that each student can get support according to their specific needs, be it additional challenges for faster comprehenders, or more detailed explanations for more difficult material. Such technology integration embraces the diversity of abilities in the classroom and helps in maximizing the learning potential of each student (Gillior, 2022).

The upshot of implementing innovative models that integrate technology in education is the emergence of a more dynamic, inclusive and personalized learning ecosystem. They replace traditional approaches, which are often one-way and generic, with approaches that promote active engagement, collaboration and student-centered learning. By harnessing the power of technology, education is now not just confined to the classroom but can also happen anytime and anywhere, allowing knowledge and skills to develop at a pace determined by the students themselves. Finally, the integration of technology in education also prepares students with the skills they need to excel in a knowledge-based society and economy, marking an important step forward in preparing future generations for the challenges of the real world.

Application of Digital Intelligence in Education

Digital intelligence plays a crucial role in transforming the way we learn in this modern era. Through specially designed apps and programs, digital intelligence helps create learning experiences that are more interactive, flexible, and adapt to the specific needs of each user (Gómez et al., 2021). For example, online learning platforms such as Coursera or Khan Academy use intelligent algorithms to recommend courses that match learners' interests or needs. In addition, apps like Duolingo utilize artificial intelligence techniques to present language exercises that adapt to the user's progress and abilities, making the language learning process more effective and personalized (Granito, 2022).

On the other hand, the use of digital intelligence-based educational programs such as Learning Management Systems (LMS) like Moodle or Blackboard, allows educators to design dynamic and interactive teaching materials that can be accessed by students from anywhere. These systems are also equipped with analytics features that track students' learning progress, allowing teachers to customize teaching methods or materials according to students' individual needs (Gulyaeva, 2021). Thus, digital

intelligence not only enriches students' learning experience but also provides educators with advanced tools to improve teaching effectiveness.

Digital intelligence has brought significant changes to student learning outcomes, opening up new opportunities in learning methods that are more adaptive and responsive to individual needs. One of the most significant positive impacts is the personalization of learning, where students can learn at their own pace, repeat material as many times as they need, and receive learning resources tailored to their unique learning styles (Hammoda, 2023). Artificial intelligence-powered programs analyze student learning data in real-time, provide constructive feedback, and adjust difficulty and question types automatically to challenge students without making them feel overwhelmed. This helps improve comprehension and retention of information, ultimately contributing to better learning outcomes (Heng & Doeur, 2022).

On the other hand, the use of digital intelligence in education also provides opportunities for students to develop important 21st century skills such as creativity, problem-solving and critical thinking. Through the use of digital tools and platforms, students can engage in collaboration-based projects, independent exploration, and creative tasks that promote active ways of learning (Holland, 2022). For example, the use of virtual simulations and AI-based educational games offer engaging experiential learning, deepening understanding of subject matter while building these important skills. Thus, digital intelligence not only improves the quality of learning outcomes in academics but also equips students with skills that will be useful to them in the future in their professional and personal lives (Kalinkina, 2020).

In conclusion, digital intelligence has revolutionized education by providing innovative ways of learning and teaching. Through personalized learning, AI-based tools, and adaptive learning programs, students can experience education that is more tailored to their needs and learning styles, improving learning effectiveness and educational outcomes. Moreover, digital intelligence also prepares students with essential 21st century skills, which are crucial in an increasingly technology-dependent world. Thus, the integration of digital intelligence in education not only has a positive impact on learning outcomes in academic aspects but also in the formation of students' character and competencies to face future challenges.

Obstacles and Solutions in Digital Educational Transformation

In integrating technology into education, there are several problems that often arise, one of which is the limited human resources with technological expertise. Although technology has been widely developed and implemented in schools, not all educators have sufficient expertise or training to use technology tools effectively in learning (Kang, 2023). This lack of training may hinder the optimal utilization of technology in the teaching and learning process. In addition, differences in technology adaptability between young and older teachers can create disparities in the use of

technology in the classroom, potentially reducing learning effectiveness for students (Khomenko, 2024).

The second issue that is often faced is limited infrastructure. In many regions, especially in rural areas or developing countries, access to advanced technology and stable internet connectivity remains a major challenge. Classrooms that are not equipped with the latest facilities or fast internet access have problems implementing technology-dependent learning models such as flipped learning or project-based learning (Kulynych, 2021). This creates an imbalance in the quality of education received by students in these areas compared to those in urbanized areas or developed countries with more complete infrastructure (Lee et al., 2023).

Finally, another obstacle is the issue of data security and privacy. With the widespread use of technology in the education system comes a greater risk to student and teacher data security. Cybercrimes, such as hacking and phishing, as well as accidental data leaks due to the use of insecure devices or weaknesses in data security systems, can cause great harm (Lemieux, 2023). Inadequate data protection not only jeopardizes personal information, but can also cause reputational and trust losses to the educational institution in question. Designing a secure IT infrastructure while ensuring conformity with privacy laws and regulations is critical in this digital age (Liebowitz, 2024).

To overcome barriers to the implementation of digital intelligence, a key strategy that can be applied is to increase human resource capacity through continuous training and professional development for teachers and education actors. This involves providing resources and training courses that focus not only on technical knowledge of digital tools and platforms but also on pedagogical methods to integrate technology into the curriculum effectively (Liu, 2023). Mentoring or coaching programs can also be very beneficial, where educators who are more experienced in digital technology can share insights and techniques with their less skilled peers. Through collaborative and continuous learning, educators can stay updated with the latest developments in education and technology, thus designing engaging and relevant lessons for their students (López-Forniés & Asión-Suñer, 2024).

In dealing with infrastructure-related issues, an effective strategy is collaboration between government, industry and educational institutions to build and strengthen ICT infrastructure in underserved areas. Investment in broadband connectivity, for example, is an important step to ensure that schools in remote areas have stable and fast internet access (Lugtu, 2022). In addition, digital resource sharing and distance learning initiatives can democratize access to quality education. Creative approaches such as learning cars or mobile laboratories equipped with ICT equipment can also be a solution for schools experiencing space constraints.

Conclusion

The digital transformation in education has brought about important findings that have a profound impact on the way we deliver and receive education. First, the adaptation and application of technology in learning has significantly increased the accessibility of education. Digital learning resources and online courses open up opportunities for individuals from diverse backgrounds, regardless of geographical location, to access high-quality educational materials. The availability of online learning platforms such as MOOCs (Massive Open Online Courses) reduces physical and economic barriers to education, allowing learning to be more inclusive and equitable.

Secondly, digital intelligence has facilitated a more personalized approach to learning, driving more effective learning outputs. With data analytics and artificial intelligence, educators can tailor learning content to the unique needs of each student, accounting for learning pace, learning style, and level of material comprehension. This leads to a richer learning experience, increasing student motivation and retention of material. The ability to tailor learning experiences according to individual requirements not only supports struggling students but also challenges those who are ready to progress faster, thus maximizing learning potential.

Lastly, the implications of digitizing education not only redefine the role of technology in learning but also prepare students with essential skills for the digital age. Students learn to collaborate virtually, think critically about online information, and use technology as a tool to solve complex problems. This prepares them not only with academic knowledge but also with digital skills that are an absolute necessity in the modern job market. Therefore, digital transformation in education not only enhances the learning experience but also contributes to the development of a resilient and adaptive future workforce.

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