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Enhancing Educational Quality Through the Use of Information Systems

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Abstract The study focuses on the significance of educational activity as an indicator of active social development in global digitisation and the issues related to its informational support. It analyses the potential of modern information systems to enhance the quality of the educational environment. The article outlines the functionality of information systems within educational institutions' informational, educational environment (IEE). It has been shown that using information systems in the educational process enhances the quality of education by employing a multi-channel approach to information dissemination. Research has established that learners at various levels can implement e-learning and possess the necessary skills to work with IEE. The introduction of innovative technological solutions into the educational environment has been proven to increase students' motivation for effective learning, stimulate the engagement of organisational reserves for continuous self-education, and intensify responsibility and self-organisation. Modern information systems offer tools and services to diversify learning and enhance effectiveness. This study shows a trend towards increased efficiency in educating students by organising independent educational work and integrating IEE's pedagogical possibilities into the educational process. The research identifies the potential for improving the quality of education in the national space through modern information technologies.

Index Terms digitalisation, information society, educational space, integration, educational process, information and communication technologies

I. Introduction

It is shaping the informational environment of life activities within the concept of the information society. Due to the rapid advancement of digital optimisation capabilities in societal processes, the education system prioritises preparing learners for activity in a digitised society. Specific solutions for digitalising the educational process are needed, which can lead to a more prosperous, flexible, and adaptive learning experience.

The issue of digitalisation and innovation in education has been studied extensively by foreign and domestic scholars. Contemporary scholars are analysing the potential for digital transformation in educational environments [1], [2]. They are also examining the impact of digitalisation on the development of higher education [3] and exploring the relationship between digitalisation and innovation Iampol [4].

Domestic scientists are discussing this issue [5]–[7] who are investigating the interplay between digitalisation and innovative development of the education system during periods of unstable socio-economic environments and crisis social phenomena. When exploring global trends in the application

of information systems to improve the quality of education, it is essential to note the publications by [8], [9]. These works analyse the current trends in the digitisation of educational tools.

The existing body of research suggests that digitising the educational environment and its innovative advancement is a current yet complex issue to investigate. Further research is necessary to explore the conceptual aspects of benchmarks, principles, and barriers to the innovative development of a quality education concept. Additionally, it is vital to identify opportunities for correction by implementing information technologies to achieve the strategic objectives of educational activities. This article aims to explore the functionality and conditions for implementing information systems to improve the quality of the national educational environment.

A. Literature review

Numerous scientific studies reflect scholars' significant interest in improving and adapting the education system to digital transformation processes within the interdisciplinary research concept. In particular, several contemporary works

highlight the structural elements of the digital optimisation of the educational environment in the context of applying modern information systems [10], investigate the specifics of forming digital competence skills in the learning process [11], and explore the peculiarities of communicative interaction [12]. At the same time, some scientists have summarised the challenges and issues of digitalisation of the educational system [13].

Among the scientific developments in the field under study, it is appropriate to highlight the research materials of scientists [14], [15], who see the potential of information systems as the foundation for the digital self-development of learners at various levels. The conceptual horizons of the problem area are expanded in the works of scientists [16], who devote significant attention to developing an individualised model of the digitalisation process of educational training based on principles of informative-operational communication.

In light of the above, most contemporary scholars interpret the implementation of modern information systems as a valuable foundation for improving the quality level of the educational environment. At the same time, the issues concerning the functional characteristics of the structural components of the digitalisation process of the learning process, as well as the analysis of the potential of modern information systems, mostly remain outside the focus of scientific inquiry or are insufficiently researched, highlighting the need for an extended examination of the subject of this study.

II. Materials and Methods

We utilised various scientific methods to achieve the research objectives, including analysis, synthesis, abstraction, induction, deduction, and comparison. During the study, we used analysis and synthesis to identify the main factors forming the essential functionality of information systems in the educational sphere within innovative development. The study employed the inductive method to develop prognostic directions for the process under investigation. Additionally, the deductive method was used to identify priority vectors for innovative transformation of the educational environment during the post-war recovery period in Ukraine. The abstraction method was applied to reveal main categories and concepts, highlight theoretical generalisations, and form conclusions regarding the priority vectors of innovative education development in the digital national post-war space. The comparison was employed to identify specific features of the contemporary innovative paradigm in the digitalisation sector of the learning process, as compared to traditional approaches. The study analysed the research object as an integrated system with interconnections and interdependencies based on complexity principles and scientific research's systemic nature.

III. Results

In the context of global integration processes and the active digitisation of social life, developing and implementing the latest digital capabilities in the educational environment is seen as a current challenge. It includes the active engagement

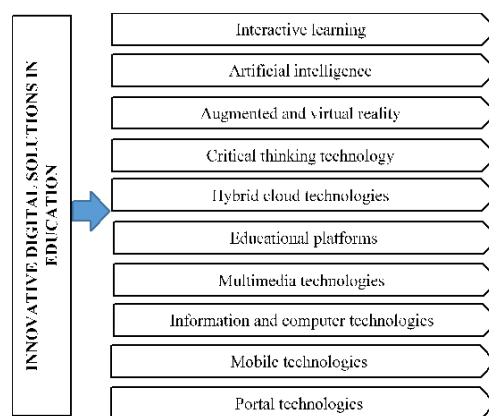


Figure 1: Innovative technologies in education. Source: the author based on [2], [3]

of information systems. The current era of societal advancement is defined by the significant impact of information and communication technologies (ICTs). These technologies facilitate the spread of information flows, shaping the global information space. Optimising education digitally is an essential component of the strategic foundation of these processes.

Ukraine is actively establishing a new approach to its education system aimed at integrating into the global information and education space. This process requires significant pedagogical theory and practice transformation, including adjusting learning technology content to modern technical capabilities [1], [2]. Information technologies are considered an integral part of the educational process, enhancing effectiveness.

The information environment facilitates effective interaction among all participants in the educational process. Contemporary information systems' primary purpose is to establish an educational environment within the institution, introduce new information tools into the learning process, and provide an informational-methodological foundation for the educational process (Figure 1).

Modern approaches to shaping the education system involve interacting with the information environment, a place for accumulating current knowledge. Practical experience analysis shows that implementing information and communication technologies and systems intensively improves the quality of the educational process [4]. The integration of information systems into the educational space involves the use of technologies for broadcasting educational data, interactive educational tools, and automated control and support for self-education [1], [2].

The current strategy for reforming the national education system is focused on integrating information and computer technologies into educational programs and utilising modern multimedia technologies with high potential [14], [15]. Regarding higher education systems, there is a trend towards intensive implementation of new technologies. These technologies facilitate unlimited opportunities for developing innovative teaching methodologies that combine traditional and

distance education elements and incorporate virtual reality algorithms. Portal and cloud technologies that offer differentiated analytics and remote access to educational information and targeted applications are considered promising. Educational institutions vary in their selection of platform types [12].

Cloud technologies are integrated into information education systems to create a digital platform for educators and learners to interact. This platform combines an expanded system of electronic diaries, journals, and personal accounts of the participants in the educational process. An educational portal is a multi-level hub of electronic educational software and resources that operate based on a comprehensive database and adhere to a unified standardisation of information exchange. The educational portal is intended for participants in the learning process to accumulate, analyse, and access educational information [8], [9]. Modern information systems and innovative teaching methods provide unrestricted access to personalised services for participants in the educational process through any internet-enabled device.

As learners and educators in an integrative education system have expanded access to various digital resources and tools, traditional teaching practices are becoming more adaptive. Textbooks are no longer considered the sole source of information, and participants in the educational process can now work using personal digital devices and the Internet. In this context, digital content is more than just a digitised textbook. It offers various interactive possibilities for processing educational material. Learners can actively interact with digital content, create new resources, communicate, and store the results of their learning activities in a personal digital environment. As a result of this process, educators can organise the educational process using a blended technology model that combines online learning with individual work. It enables educators to select resources for personalised learning and organise projects for effective interaction.

Digitised educational resources should be actively involved in the learning process to implement strategic directions for digital optimisation of the education system. The significant variability of tools for creating and effectively using these resources contributes to their efficient mastery. To achieve quality pedagogical design of digital opportunities, it is essential to target educational content, operate various sources of information, and understand the limits of their potential. Effective interaction among participants in the educational process ensures a higher quality of learning through various resources and the range of possibilities offered by digital educational content.

It is important to note that the development of information and computer technologies is advancing faster than their implementation into the education system. Integrating available technological innovations into the educational environment represents the direction of the prospective development of information education systems. It has significant potential [5]–[7]. With powerful search tools, educational activities at various levels can be significantly enhanced. Additionally, integrating information and computer technologies in the learn-

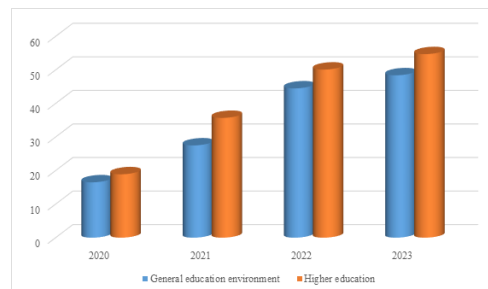


Figure 2: Using Information Systems in the National Education Space, %. Source: the author based on (Ministry of Education and Science of Ukraine, 2024)

ing process enables the development of a teaching strategy that fosters reflection, stimulates cognitive activity, promotes independence, and encourages creative self-realisation in the learning process.

The use of informative data is crucial for improving the quality of education by implementing information technologies. Such data arrays enable the identification of strategic goals and objectives, the maximisation of emerging opportunities, and the making of appropriate, reasoned, and timely management decisions [10]. The use of information systems in education enables the effective utilisation of electronic educational resources, tracking learner performance at all levels, continuous monitoring of teaching quality, and observing the dynamics of the educational services market.

Portal technology is currently considered the most suitable solution for addressing the issues outlined. It enables effective information flow management and digital tools while enhancing media competency. The technology proposed facilitates the minimisation of resource consumption in the learning process while intensifying its effectiveness [8], [9]. Additionally, individual educational platforms provide ICT support to learners, which is necessary to master the informational, educational environment effectively.

The challenge of enhancing the quality of education through implementing information systems relies on using concentric information technologies. These integrate a collection of current information bases, tools, and synthesis methods into a single digital space. The aim is to satisfy the informational needs of educational institutions to the fullest extent possible. The strategy outlined here involves integrating management tools into the information sphere to create a unified digital platform for educational institutions. It includes creating universal tools for informatisation and information interaction methods that reflect the information environment's dynamics.

Thus, implementing information systems is effective for learning and provides overall informational and intellectual support for the educational space. A potential avenue for further developing this research theme involves identifying criteria for evaluating the effectiveness of different types of educational content in digital formats. Additionally, analysing

the specific implementation of new types of learning resources based on virtual and augmented reality technologies is crucial. The outlined concept will require justification of the stages and content of the pedagogical design of digital resources and interaction. Moreover, the potential of portal technologies in creating individual educational trajectories and designing pedagogy requires attention.

However, amidst the global integration processes in education, the primary task remains to preserve and enhance the quality of education. To achieve this goal, it is necessary to have adequate technical equipment for the integrated educational process and to select optimal software for information systems and portal platforms. Effective monitoring and controlling should also be organised.

IV. Discussion

It is essential to consider researchers' findings on the process's key aspects to explore the potential of information systems in the contemporary educational environment. The scientific literature on learning methodology in the era of digital transformation of the labour market presents a variety of interpretations of this concept, indicating the need for a unified approach to its definition. The analysis of scientific work suggests that modern educational training relies on using modern software to activate and stimulate the process of resource transformation, thereby enhancing the effectiveness of activities.

According to Szymkowiak et al. [17], Castro and Tumibay [18], information systems are considered a hub of digital optimisation for the scientific and educational sphere, particularly in the current complex economic conditions compounded by crisis phenomena. Efficient integration and coordination of participants' activities in the priority directions of socio-economic development are required. In turn, representatives of another scientific school [19] emphasise the direction of sustainable development of educational activity from a systemic perspective and in the aspect of digital optimisation.

Contemporary scholars [20] argue that an innovative approach to the educational process is only feasible under favourable social conditions, effective internal interaction, and successful institutional functioning. The authors also stress the need for individualised solutions for each educational institution. Researchers [21], [22] suggest that a phased and interconnected study of psychological, cultural, ethical, and deontological aspects of learning is necessary for the practical application of interdisciplinary integration tools in the educational process.

Among contemporary approaches to the convergence of digital and innovative transformations in education, researchers [23] advocate for positioning the educational environment as a reflection of the general social situation. Meanwhile, researchers of progressive approaches to sustainable development in the educational sphere [24] argue that intensifying the provision of information in the educational process is possible through coordinated interaction among all participants.

Contemporary scientists' research results and analysis demonstrate the relevance of forming an innovative paradigm in education. This paradigm combines the principles of sustainable development and digitisation. Promising research in this area includes studying the ethical and legal aspects of applying information systems in educational activities.

V. Conclusion

Research has shown that the synergy of innovative information systems and digital transformation is a priority for the quality development of the educational sphere in Ukraine. The proposed concept aligns with the contemporary direction of innovative technologies in developing educational activities under complex conditions of uncertainty.

Ukraine has the prerequisites for successfully introducing foreign experience in implementing digital and innovative solutions into the educational paradigm. Management decisions regarding digital technology implementation require a situational strategy that ensures an individual approach to each organisational or managerial change.

The research has shown that the priority direction for developing education quality policy is forming a strategy for implementing information systems into the educational environment, considering the trend of integrating the educational space into the European community.

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