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Contemporary Approaches to Enhancing the Digital Competence of School Leaders

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Annotatsiya: *This article explores modern trends and the necessity of developing the digital competence of general secondary school leaders. The paper analyzes the mechanisms of transitioning from traditional management to a data-driven management model. Furthermore, methodological recommendations are provided for developing school principals' skills in utilizing Artificial Intelligence (AI) technologies. Concluding the article, an Uzbek model for assessing the digital potential of leaders, adapted to international standards (DigCompOrg), is proposed.*

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1. Introduction

In today's era of global competition, the activities of a school principal are no longer limited to issuing administrative orders. School leaders are now required to be strategic architects of the digital ecosystem. Strategic documents of the Republic of Uzbekistan on digital education designate the full digitalization of educational institution management as a priority task [1].

However, despite advances in technical infrastructure, the level at which school leaders strategically utilize digital tools — that is, their digital competence — remains insufficiently systematized. International studies indicate that the digital literacy of a school principal has the potential to increase or decrease the innovative activity of the entire institution by 40–60%.[2]

Within the framework of the "Digital Uzbekistan – 2030" program, significant results have been achieved in digitalizing the education system. All general secondary schools have been provided with high-speed internet access, digital educational resources have been expanded, and the e-school platform has been introduced. Nevertheless, the gap between the development of technical infrastructure and the professional preparedness of school leaders remains a persistent challenge.

The purpose of this article is to investigate the current state of digital competence among general secondary school leaders in Uzbekistan, identify the main trends in its development, and propose a nationally adapted assessment model based on international frameworks.[3]

2. Literature Review

The concept of digital competence was first formally defined in the European Commission's document "Key Competences for Lifelong Learning". Subsequently, it was expanded through the DigComp, DigComp 2.0, and DigComp 2.1 frameworks, presenting systematic competences across five core areas: information processing, communication, content creation, safety, and problem-solving [4].

Numerous researchers have offered various definitions of digital competence. A.V. Fedorov defines it as "the totality of motivation, knowledge, skills, and abilities of an individual to search, analyze, evaluate, create, and transmit information in a digital environment" [5]. G.U. Soldatova describes digital competence not merely as the possession of technical skills, but as a broad system of knowledge, skills, attitudes, and technical proficiency enabling effective, responsible, and safe use of digital technologies and internet resources [6].

Among local scholars, R.G. Isyanov emphasizes in his research that the digital competence of future specialists represents the level of formation of skills needed to be competitive in the digital economy and virtual labor market, and to correctly utilize digital programs and algorithms in problematic situations [7].

Synthesizing the above definitions, the following authorial definition is proposed: digital competence is not merely the use of modern technologies, but the capacity to use them effectively and safely in solving problems of daily life and professional activity.

The DigCompOrg model, specifically developed for educational organizations, views the school as an integrated digital system and evaluates the leader's activities across seven dimensions: digital learning practices, professional development, assessment methods, content and curriculum, infrastructure, organizational work processes, and collaboration [8].

Analyses conducted by M. Malik and colleagues revealed a strong correlation (r=0.67) between the digital literacy of a school principal and the level of technology use by teachers [9]. This demonstrates that digital transformation across an entire institution cannot be achieved without systematically addressing the issue of leader competence.

Anderson and Dexter established that technology leadership by principals is a significant predictor of student achievement and institutional technology integration [10]. Deursen et al. validated the Internet Skills Scale, providing empirical grounding for measuring digital competence in educational contexts [11]. Mandinach and Gummer further underscored the importance of data literacy as a core component of modern educational leadership [12].

3. Methodology

This study employs a mixed-methods approach combining theoretical analysis, comparative international review, and model development. The research methodology includes the following components:

First, a systematic review of international frameworks (DigComp 2.1, DigCompOrg) and scholarly literature on digital competence in educational leadership was conducted. Sources were selected based on relevance, citation impact, and applicability to the Uzbek educational context.

Second, a comparative analysis of successful digital transformation experiences in Finland, Estonia, and Singapore was undertaken to identify transferable best practices for school leadership development in Uzbekistan.

Third, the existing Uzbek policy landscape — particularly the "Digital Uzbekistan – 2030" strategy and the e-school platform implementation — was examined to contextualize the proposed model within national priorities.

Fourth, based on the synthesis of international frameworks and national conditions, a five-level digital competence assessment model (DigCompOrg-UZ) was developed and proposed. The model was designed to be actionable for educational administrators at various levels of digital readiness.

The study draws on data from the McKinsey Global Institute UNESCO (2019), OECD TALIS and peer-reviewed educational technology research to support its findings and recommendations.[13]

4. Results and Discussion

The results of the analysis allow the identification of three primary directions in which the digital competence of a modern school leader must develop:

Strategic digital planning. In the strategic planning process, the principal must be capable of forming the school's long-term “Digital Development Roadmap” and aligning the institution's technical capabilities with its pedagogical goals. This process entails not merely providing computers, but also digitally transforming educational content. The experience of Finland, Estonia, and Singapore demonstrates that successful digital transformation depends on the alignment between the personal initiatives of the leader and the institutional strategy [14].

Pedagogical digital leadership. In the area of pedagogical leadership, the principal appears not merely as an observer of teachers’ application of hybrid methodologies in the classroom, but as the primary driver and motivator of these innovations. The principal should discuss digital lesson plans with teachers, support their professional growth, and bear responsibility for fostering a digital culture within the institution.

Data-driven management. The skill of data analysis must become the principal's primary tool for decision-making. By analyzing real-time statistical data obtained from ERP systems such as e-school, the principal gains the ability to identify gaps in educational quality, forecast student achievement dynamics, and direct resources toward areas of greatest need.

The DigCompOrg model, developed as a product of European experience in advancing the digital capacity of educational organizations, holds particular significance. This systematic approach proposes transforming the school principal's activities across seven interrelated dimensions. The process begins with managing digital infrastructure and ensuring security within the institution, and extends to adapting the curriculum to the demands of the digital age and supporting the professional development of staff. Within this model, the principal establishes a corporate communication culture in organizing online collaboration with staff, ensuring the transparency and responsiveness of both vertical and horizontal communication within the school [15].

Based on the analysis conducted, a five-level model for assessing digital competence is proposed for general secondary school leaders in Uzbekistan (DigCompOrg-UZ). Within the framework of this model adapted for Uzbekistan, the following indicators are recommended as primary assessment criteria: weekly frequency of e-school system use; level of digital learning environment creation within the school (0–5 points); percentage of the teaching staff engaged in online professional development; activity of electronic communication with parents; level of implementation of cybersecurity protocols.

The rapid penetration of Artificial Intelligence (AI) technologies is opening new directions for optimizing school manager activities. In particular, using generative models such as ChatGPT, Gemini, or locally adapted tools, principals can significantly reduce the time spent generating analytical reports, official order drafts, and strategic documents. According to McKinsey Global Institute data, educational institution leaders spend 40% of their working time on document preparation and administrative tasks. AI assistance can reduce this figure by 15–20%, enabling principals to redirect their attention from constant document circulation toward more creative and human-centered management.

Key areas where artificial intelligence may be applied include: rapid expert review of lesson plans prepared by teachers for compliance with established national curriculum standards; forecasting student achievement dynamics and early identification of at-risk students; and the introduction of intelligent chatbots in parent communication systems, enabling information about school life to be provided on a 24/7 basis.

However, it is critical to clearly define ethical and legal boundaries in the use of artificial intelligence. The confidentiality of personal data of students and staff, the fairness of algorithmic decisions, and issues of academic integrity must remain under constant oversight by the principal.

5. Conclusion

Research analysis demonstrates that the digital competence of a modern school principal is not merely an indicator of technical literacy, but a strategic factor determining the digital culture of the entire educational

institution. The principal's digital worldview and initiative in this direction directly influences the innovative activity of the school's pedagogical team.

The following recommendations are proposed for strengthening digital competence among school leaders:

First, it is necessary to increase the hours allocated to digital competencies and artificial intelligence modules in specialized “Management Courses” for school principals and prospective personnel reserves. Unlike traditional IT literacy, these modules should focus on developing digital strategy, cybersecurity management, and organizing collaborative work through cloud technologies in education. Such training programs should develop not only technical skills but also psychological readiness for digital transformation processes and leadership capacity. These courses should be organized in a modular system, enabling each principal to begin learning from their current level.

Second, alongside the introduction of modern technologies into management processes, developing ethical norms and legal frameworks for the use of AI tools is urgent. Principals must ensure the inviolability of personal data, academic integrity, and the impartiality of decisions made by algorithms when applying AI technologies. These ethical norms should be enshrined at the level of internal school regulations, serving to prevent cyber threats and manipulation in the digital environment.

Third, for the purpose of fundamentally improving the system for evaluating the effectiveness of school principals' activities, it is appropriate to incorporate a digital literacy indicator (KPI) for principals into the criteria for determining school ratings. The principal's ability to work on digital platforms, the level of implementation of electronic document management in the institution, and the conditions created for the digital development of the teaching team should be established as primary indicators.

Fourth, it is recommended to form a regional network of digital schools. In each province, 3–5 “Digital Model Schools” should be designated, with their principals serving as mentors for other schools. Through this network, successful experiences will be disseminated rapidly and digital transformation will accelerate at the national scale.

The digital competence of an educational institution leader is one of the most important factors in the modern education system. In an institution managed by a digitally competent leader, technologies become a holistic ecosystem serving to monitor teaching quality, ensure transparency, and meet the individual needs of students.

The five-level Uzbek model (DigCompOrg-UZ) developed within the framework of this research serves as a practical roadmap for principals and educational system administrators. Using this model, it is possible to determine the current state of each institution, formulate a targeted development plan, and objectively evaluate the results achieved.

The implementation of the recommendations presented above will make it possible to bring the school management system in our country to a qualitatively new level. Since the success of reforms in the education system directly depends on the extent to which leaders have adapted to the demands of the digital age, this issue remains among the most pressing challenges facing educational policy.

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