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Approaches to Training Primary Education Specialists Based on International Digital Competence Standards

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Abstract: This article analyzes the issue of developing digital competence among primary education specialists based on international standards, national studies, and regional approaches. The advantages of an integrative approach, the need for adaptation, and the role of a two-level assessment system are discussed. The findings demonstrate that enhancing teachers' digital competence not only improves the quality of education but also fosters independence, creativity, and critical thinking in learners. The conclusions serve as methodological and strategic guidelines for the modernization of the primary education system.

Keywords: Digital competence, primary education specialist, integrative approach, international standards, national research, two-level assessment system, pedagogical innovation, creative thinking.

Introduction: The digital transformation of education today is rapidly evolving not only in higher education but also in preschool and primary education. Consequently, the formation of digital competences in training primary education specialists has become a globally relevant task. A modern primary school teacher is no longer regarded merely as a transmitter of knowledge, but rather as a designer of learning processes in a digital environment, an integrator of pedagogical technologies, and a facilitator who supports learners' independence and creativity. Within this context, exploring international experience and integrating it into the national framework acquires both scientific and practical significance.

On the international level, several standards and frameworks on digital competence have been developed. For instance, the European Commission's DigCompEdu model is one of the most widely used methodological references for teachers. It covers six key areas and 22 competences and demonstrates gradual development through a system of proficiency levels (A1-C2). The ICT-CFT framework developed by UNESCO, in turn, conceptualizes digital competence as being closely interconnected with the entire educational process and the professional growth of teachers. Additionally, the ISTE Standards, which are based on 21st-century skills, are directed towards guiding teachers in organizing effective digital practices. What these frameworks have in common is that they encompass not only technical skills but also didactic, methodological, communicative, collaborative, and reflective dimensions. In the preparation of primary education specialists, the use of international standards is important in two respects. Firstly, they provide a unified conceptual approach to teacher training and help integrate the national education system into global practice. Secondly, they allow digital competence to be viewed not merely as knowledge of technologies, but as a tool for achieving didactic aims, addressing learners' needs, and fostering a safe and responsible digital culture.

METHODOLOGY

This article has a theoretical and analytical character, employing the methods of literature review and comparative analysis. Within the chosen methodology, conceptual analysis was applied to explore the key

concepts, components, and levels of international standards; for example, in the DigCompEdu framework, teachers' digital competence is described across six domains. Comparative analysis was used to examine UNESCO's ICT-CFT, the ISTE Standards, and DigCompEdu, highlighting their commonalities and differences. A systemic approach was also adopted, in which the motivational, cognitive, operational, and reflective elements of digital competence were considered as integral parts of a single pedagogical system. Furthermore, the principles of flexibility, personalization, security, and cooperation emphasized in international practice were examined in alignment with national education policy. The study is not experimental but rather based on theoretical sources, presenting conceptual proposals on the practical application of international standards in the preparation of primary education specialists. Specifically, the paper suggests developing diagnostic criteria aligned with DigCompEdu levels, adapting UNESCO's ICT-CFT principles to national qualification requirements, and using the ISTE Standards as methodological recommendations.

LITERATURE REVIEW

In order to provide a broader interpretation of the concept of digital competence, the definition proposed by Ilomäki is of particular importance. She explains digital competence not only as a set of technical skills, but also as a construct closely connected to socio-emotional aspects, including the ability to select, evaluate, and consciously apply information. Such an approach significantly expands the opportunities for preparing primary education teachers, as it enhances their capacity to build meaningful interactions with pupils and to foster digital culture in the learning environment. The DigCompEdu framework, developed by the European Commission, enables a systematic delineation of teachers' digital competences. In S.Redecker's study, the six domains and twenty-two key competences of this model are extensively elaborated [5]. The author aligns these competences with the CEFR proficiency levels, thus presenting them in a progressive structure ranging from A1 to C2. For the training of primary education specialists, this model is particularly valuable, as it provides not only a framework for defining and diagnosing competence levels, but also ensures a step-by-step trajectory of professional development.

The ICT Competency Framework for Teachers (ICT-CFT) developed by UNESCO can likewise be regarded as a comprehensive instrument for fostering digital competence. This framework is designed to ensure the professional development of teachers through the integration of educational policies, curricula, pedagogical methods, and technologies [8]. Within the context of primary education, it is particularly relevant, as it may be applied not only to support teachers' professional practice but also to enhance the digital literacy of their pupils.

The ISTE Standards also play a significant role in the domain of digital competence. These standards encourage teachers to adopt innovative approaches while positioning learners as active participants in the educational process. In Willermark's study, the Scandinavian experience is presented as an illustrative case, where teachers' roles in digital leadership, collaboration, and creative practice are explored in detail [9]. Such an approach is directly pertinent to the preparation of primary education specialists, as teachers' responsibilities extend beyond familiarizing children with new technologies; they are also expected to nurture learners as conscious users and creative individuals.

The OECD report published in 2024 emphasizes specific competences for preschool and primary school teachers. According to the report, teachers should not be limited to possessing digital skills alone, but must also demonstrate the ability to communicate effectively with parents, observe principles of digital safety and ethics, and support children's independent digital experiences [4]. These recommendations enrich the theoretical foundations of teacher education, underscoring the significance of social and ethical responsibility in the professional competence of primary education specialists.

It is also essential to highlight research conducted within the national context. For instance, the work of M.Karimova develops the theoretical foundations of pedagogical competence and creativity, emphasizing the need to closely interlink digital competence with pedagogical creativity [3]. Similarly, the teaching guide authored by N.Sayidova serves as a practically significant source, providing methodological

recommendations for preparing teachers in areas such as digital didactics, media literacy, information security, and the creation of creative digital content [6]. These guidelines can be directly applied in the professional training of primary school teachers.

Research carried out by Russian scholars also deserves particular attention. Shauxalova designed a system for the formation of digital culture, structuring it into cognitive, motivational, reflexive, and personal-developmental components. Khamatvalieva, in turn, proposed a model for developing the methodological competence of future primary school teachers in a digital environment . Husainova analyzed the psychological and pedagogical conditions required to cultivate digital competence among students in creative disciplines, thereby enriching the methodological foundations for fostering creativity in primary education specialists. Yakovleva's work further contributes to this discourse by conceptualizing future teachers' digital competence across four components: motivational-personal, cognitive, activity-based, and reflexive-evaluative [10]. These components demonstrate a strong correlation with the domains outlined in the DigCompEdu framework and can serve as a useful basis for the development of diagnostic and assessment criteria.

In addition, Tzafilkou's study introduced a 20-item scale for assessing teachers' digital competence [7], a methodological tool that could be adapted to design diagnostic instruments specifically tailored for primary education specialists. Taken together, the review of literature demonstrates that the concept of digital competence has been thoroughly elaborated at the international level, yet its adaptation to the context of training primary education specialists remains an urgent scholarly and practical task. Only by integrating the theoretical foundations offered by international frameworks with the applied insights of Russian and Uzbek researchers, alongside national policy documents and diagnostic tools, can a truly effective systemic pedagogical concept for developing digital competence be designed.

RESULTS AND DISCUSSION

Internationally developed digital competence standards serve as a key instrument in defining general directions within education systems. Their primary advantage lies in the broad interpretation of digital competence extending from technical knowledge to socio-emotional skills. As a result, teachers are required not only to use digital tools but also to meaningfully integrate them into the learning process. Some frameworks divide teachers' activities into areas such as professional development, the use of resources, enhancement of learners' digital literacy, technology-supported teaching, and assessment. Such a structure makes it possible to analyze and evaluate teachers' digital competence progressively, step by step. However, the complete implementation of these standards does not yield uniform results across all countries. In developed contexts, where technical infrastructure and resources are sufficient, adoption is comparatively straightforward. In contrast, in countries such as Uzbekistan, disparities in internet speed, school equipment, and teachers' initial training create obstacles to full integration. Consequently, direct application of international models is not always feasible; instead, their adaptation to the specific national context becomes essential.

Research conducted within the national education system is primarily practice-oriented. Its main strength lies in being developed with close consideration of the actual conditions of the Uzbek educational context. For example, specific methodological guidelines have been elaborated in such areas as digital didactics, media literacy, information security, and creative content production. These guidelines can be directly applied to primary school teachers, since their everyday work is largely aimed at organizing lessons in an interactive format. However, a notable limitation of national research is that it is often not aligned with international benchmarks. For instance, while teachers' creative skills or knowledge related to information security are highlighted, these aspects are not sufficiently connected to tiered assessment systems. As a result, a certain gap emerges between international standards and national research.

Studies conducted in comparable educational contexts are also of significance in relation to primary education. In most of these studies, digital competence is examined through motivational, cognitive, technological, and communicative components. Such an approach makes it possible to ensure the balanced development of both personal and professional

qualities. Yet, these models are not without problems. Some are excessively theoretical, paying insufficient attention to diagnostic instruments and mechanisms of practical assessment. Therefore, rather than being fully implemented, these models are more appropriately integrated selectively and harmonized with international methodologies.

One of the most crucial issues in the development of digital competence is the assessment system. In international practice, well-designed scales make it possible to evaluate teachers' knowledge and skills through clearly defined indicators. For example, a teacher's ability to use technologies in the classroom, to support students' independent learning, or to create digital resources is measured through specific criteria. In contrast, assessment in the national context often remains limited to theoretical descriptions, which makes it essential to combine two complementary dimensions: on the one hand, the identification of theoretical knowledge and skills, and on the other hand, the evaluation of practical performance. Only when these two approaches are integrated can the true level of a primary school teacher's digital preparedness be revealed. International standards provide a strategic foundation, national research offers practical insights, while regional studies contribute valuable methodological enrichment. Therefore, the most effective way to foster digital competence among primary education specialists is through an integrative approach. The model to be developed should rest on principles such as adapting international standards to national needs and conditions, aligning national and regional findings with global frameworks, applying theoretical knowledge in practice, and introducing a dual-level assessment system that evaluates both theoretical and practical competences together.

CONCLUSION

The development of digital competence among primary education specialists today stands as one of the most pressing challenges in the education system. It not only aligns teachers' professional preparation with contemporary requirements but also contributes to their personal development and enhances the overall quality of education. International standards such as UNESCO ICT-CFT, DigCompEdu, OECD, and ISTE emphasize that teachers should move beyond technical proficiency to meaningfully integrate digital tools into the learning process. However, the direct application of these frameworks in Uzbekistan remains difficult due to disparities in infrastructure and resources, making contextual adaptation essential. National research highlights practical aspects such as digital didactics, media literacy, and reflective practice, yet lacks full alignment with international benchmarks. Regional studies, in turn, outline motivational, cognitive, and communicative components, but their diagnostic mechanisms remain underdeveloped. To ensure a comprehensive assessment, both theoretical knowledge and practical activity must be considered through a dual-level evaluation approach that combines theoretical and practical dimensions. Hence, an integrative strategy emerges as the most effective path: it fosters teachers' digital competence, raises the quality of education, cultivates independent learning as well as creative and critical thinking among pupils, and ultimately contributes to the modernization of the primary education system.

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