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DEVELOPING INFORMATION COMPETENCE IN FUTURE PRIMARY SCHOOL TEACHERS THROUGH VIRTUAL TECHNOLOGIES: IMPLEMENTATION OF A SYSTEM-BASED APPROACH

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Abstract

This paper examines the role of virtual technologies in developing information competence among future primary school teachers and proposes a system-based approach for integrating digital tools into teacher education. The study emphasizes the importance of digital transformation in education and highlights how virtual learning environments enhance pedagogical preparation, self-directed learning, and professional adaptability.

The research findings suggest that structured implementation of virtual technologies significantly improves students' ability to access, analyze, and apply information in educational contexts. The proposed model includes diagnostic, motivational, theoretical-practical, and monitoring stages aimed at systematically developing information competence in teacher training programs.

Keywords: information competence, virtual technologies, digital education, primary education, teacher training, ICT integration.

In recent years, Uzbekistan has been implementing large-scale reforms aimed at modernizing the higher education system, aligning it with international standards, and accelerating digital transformation. In particular, the "Uzbekistan–2030"

Strategy, the Concept for the Development of the Higher Education System, and national programs for digital economy development have identified the digitalization of education, the introduction of innovative pedagogical technologies, and the enhancement of teachers' professional competencies as priority directions.

As a result of these reforms, a gradual transition from traditional teaching approaches to competency-based and digital education models has been observed in higher education institutions. Special attention is being paid to the integration of information and communication technologies (ICT) and virtual learning environments in the training of future teachers. This, in turn, highlights the urgent need to develop information competence among future primary school teachers.

Currently, improving the quality of primary education, organizing interactive and effective learning processes, and enhancing teachers' digital literacy have become critical tasks. Primary education plays a fundamental role in shaping learners' cognitive development, information processing skills, and motivation for lifelong learning.

In this context, the development of information competence in future primary school teachers through virtual technologies represents one of the key scientific and practical challenges in modern pedagogical education. The systematic integration of virtual technologies into teacher training programs not only improves educational quality but also strengthens innovative teaching practices and supports the integration of educators into the global digital learning environment.

In the context of rapid digital transformation, education systems worldwide are undergoing significant changes. The integration of virtual technologies into teacher education has become a critical factor in preparing competent and innovative educators. In particular, future primary school teachers must develop

strong information competence to effectively manage digital resources and create interactive learning environments for young learners.

Information competence is considered a key component of professional competence in modern pedagogy. It includes the ability to search, evaluate, process, and apply information using digital tools. For primary education teachers, this competence is especially important as it directly influences the quality of early childhood learning and cognitive development.

Information competence can be defined as a combination of knowledge, skills, and attitudes that enable individuals to work effectively with information in digital environments. In teacher education, it includes:

ability to use information and communication technologies (ICT);

skills in selecting and evaluating digital learning resources;

competence in designing multimedia-based lessons;

experience in working with virtual learning platforms;

awareness of digital safety and ethics.

Virtual technologies such as learning management systems, simulation tools, interactive platforms, and virtual classrooms provide a powerful foundation for developing these competencies.

Methodology

The study is based on theoretical analysis, comparative research, and pedagogical observation. A system-based approach was applied to examine how virtual technologies can be integrated into teacher training curricula.

The research methodology includes:competency-based approach, system-activity approach,digital learning integration model, pedagogical innovation framework.

Data were analyzed from academic literature, educational experiments, and practical teaching experiences in higher education institutions.

System-Based Model for Developing Information Competence. The proposed model for developing information competence among future primary school teachers consists of four interrelated stages:

Diagnostic Stage At this stage, students' initial digital literacy levels are assessed through tests, questionnaires, and practical assignments. This helps identify strengths and areas for improvement.

Motivational Stage.Students are introduced to the importance of virtual technologies in modern education. This stage aims to develop interest and positive attitudes toward digital learning tools.

Theoretical-Practical Stage. Students acquire theoretical knowledge and practical skills in using ICT tools such as Moodle, Google Classroom, Zoom, and interactive educational software. They also learn to design digital lesson materials and multimedia presentations.

Practical Application Stage. Students actively engage in creating virtual lessons, interactive tasks, and digital educational resources. This stage simulates real teaching environments and strengthens professional readiness.

Monitoring and Evaluation Stage. The effectiveness of the training process is evaluated through performance assessments, portfolio analysis, and competency-based evaluation criteria.

The integration of virtual technologies into teacher education significantly enhances the development of information competence. The results of the study indicate that students exposed to digital learning environments demonstrate:

improved ability to work with information;
higher levels of independent learning;
increased creativity and innovation in lesson design;
stronger motivation for professional development.

Furthermore, virtual technologies contribute to bridging the gap between theoretical knowledge and practical teaching skills, making teacher education more dynamic and effective. However, successful implementation requires adequate technological infrastructure, trained instructors, and continuous methodological support. Without these conditions, the potential of virtual technologies cannot be fully realized.

The development of information competence through virtual technologies is a fundamental requirement in modern teacher education. The proposed system-based approach provides a structured framework for integrating digital tools into the training of future primary school teachers. The findings confirm that a step-by-step implementation model significantly improves students' digital literacy, pedagogical skills, and readiness for innovative teaching practices. Therefore, virtual technologies should be considered an essential component of contemporary teacher education programs aimed at preparing highly qualified and competitive educators.

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