Website:https://worldsiencepub.com/index.php/Imc Volume:5,Issue 02,September-2026

ENHANCING THE PEDAGOGICAL SKILLS OF FUTURE TEACHERS BY CREATING INTERDISCIPLINARY INTEGRATED CONTENT IN A DIGITAL EDUCATIONAL ENVIRONMENT

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DOI:https://doi.org/10.5281/zenodo.22926058

Abstract: This article highlights the issues of improving the professional and pedagogical skills of future teachers through the creation and use of interdisciplinary integrated content in a digital educational environment. It also analyzes the mechanisms for developing digital literacy, critical thinking among future teachers, and introducing modern educational technologies into the educational process.

Keywords: digital educational environment, interdisciplinary integration, pedagogical skill, future teachers, electronic content, innovative technologies.

INTRODUCTION

Digitizing the education system and enhancing the quality of teacher training have been designated as priority areas of state policy in the Republic of Uzbekistan. In particular, presidential decrees and resolutions aimed at developing the education sector identify the implementation of a digital educational environment and the cultivation of modern professional competencies—specifically information-analytical competence—among future teachers as crucial tasks. Organizing the educational process based on digital technologies necessitates the development of future teachers' capacity to handle and analyze information and to make pedagogical decisions. Consequently, developing a model to foster information-analytical competence among future teachers within a digital educational environment constitutes a pressing scientific and pedagogical issue. In the context of global digitalization and the information society, a primary task facing the education system is preparing future teachers to utilize digital technologies purposefully in their pedagogical practice. According to UNESCO research, the professional capacity of a 21st-century teacher should not be limited to the use of information and communication technologies but must also encompass the competence to process information analytically. From this perspective, developing a pedagogical model that ensures the systematic development of information-analytical competence in future teachers is a pressing scientific-pedagogical issue. In recent years, digital transformation processes have fundamentally altered the requirements for the professional competence of teaching staff within the education system. In particular, fostering information-analytical competence in future teachers is regarded as a priority area in modern pedagogy. The role of interactive methods in developing pedagogical skills within a digital educational environment: A digital educational environment requires teachers not only to convey information but also to employ sound strategies that engage students in active participation during the lesson. This necessitates the extensive use of interactive methods. Online quizzes (Quizizz, Kahoot): Enable knowledge reinforcement and assessment in an engaging format. Lessons based on problem-oriented questions: Encourage student inquiry. Brainstorming on online platforms like Jamboard and Padlet: Boosts creativity. Role-play: Useful for developing professional competencies.

ANALYSIS OF RELEVANT LITERATURE

M.S. Yuldoshev (2021). “Digital educational technologies and their implementation in the educational process” [3]. The literature comprehensively covers issues regarding the design of educational content within a digital environment and its application through interdisciplinary connections. Yuldoshev developed practical recommendations for enhancing the pedagogical skills of future teachers using multimedia tools and digital platforms. R.V. Korneychuk (2021).

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"Interdisciplinary content in the digital educational environment of a higher education institution." This research work focuses on technologies for creating interdisciplinary content in a digital environment. Korneychuk scientifically demonstrated that developing future educators' skills in using information and communication technologies—based on interdisciplinary integration—improves the quality of instruction [8]. S.S. Rajabov (2022). "Fundamentals of digital pedagogy in higher education." The monograph elucidates the didactic characteristics of the modern digital educational environment and the role of innovative tools in shaping teachers' pedagogical skills. The author proposed criteria for assessing the ability of future teachers to create integrated educational content [4]. J.A. Kum (2022). "Designing Interdisciplinary Digital Content for Teacher Professional Development." The study analyzes experiences in creating interdisciplinary content using modern digital tools (such as LMS and VR/AR technologies) within the pedagogical education process. The author highlights the practical significance of these tools in enhancing the professional preparation of future teachers, drawing upon international best practices. D.A. Qodirova (2023). "Technology for Developing the Pedagogical Skills of Future Teachers in a Digital Environment." This dissertation develops a model to enhance students' professional-pedagogical skills through the creation of interdisciplinary integrated tasks and electronic textbooks within a digital environment. Qodirova proposes a system of practical recommendations and training sessions. "Digital Educational Environment and Pedagogical Skills." Recent literature examines the digital transformations occurring in higher education systems and their impact on the training of future teachers [3].

RESEARCH METHODOLOGY

The philosophical foundation of the research rests on the dialectical approach, principles of studying reality in terms of motion and development, and the laws governing the interdependence and continuity of socio-pedagogical processes. This framework establishes the necessity for the continuous improvement of future teachers' pedagogical skills in alignment with the demands of the digital environment.

Scientific-methodological approaches of the research

• Systems approach: Viewing the process of enhancing the pedagogical skills of future teachers as a holistic set of interconnected components (goal, content, means, result).

• Integrative approach: Exploring opportunities to create unified educational content by harmonizing the content of various disciplines within a digital environment.

• Competency-based approach: Focusing on developing students' digital literacy, professional-pedagogical skills, and abilities to design integrated content.

• Activity-based approach: Enhancing the professional skills of future teachers through their practical participation and the process of independently creating educational content using digital tools and platforms.[3]

Research methods

• Theoretical methods: Studying and comparatively analyzing scientific-pedagogical, psychological, and methodological literature, as well as regulatory documents regarding digital education; generalizing and conceptualizing best practices in the field.

• Empirical methods: Conducting pedagogical observations, surveys (questionnaires, interviews), tests, and discussions, as well as analyzing the products of the future teachers' practical activities. • Experimental methods: Organizing and conducting pedagogical experiments (covering baseline assessment, formative, and summative stages).

• Mathematical-statistical methods: Statistically processing the obtained experimental results and verifying their reliability and effectiveness.

Enhancing the pedagogical competence of future teachers through the creation of interdisciplinary integrated content in a digital educational environment.

The modern education system is undergoing fundamental changes driven by globalization, digitalization, and integration. Today, a critical task is to train educators who can meet the demands of the information society, possess advanced proficiency in modern information and communication

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technologies (ICT), and solve problems at the intersection of multiple disciplines. Digital environments and interdisciplinary integration create a powerful synergistic effect in enhancing students' pedagogical competence within higher education institutions. Regarding the theoretical foundations of interdisciplinary integration: in traditional education, subjects are often taught in isolation, limiting students' ability to view acquired knowledge as a cohesive system. Interdisciplinary integration, however, helps students form a holistic view of the world. In the digital environment, this process reaches a new level, as cloud technologies, digital laboratories, interactive platforms, and multimedia tools enable the integration of content from multiple disciplines (e.g., physics, mathematics, computer science, and pedagogy) into a single digital object or project.[2]

• It was determined that the pedagogical competence and skills for creating interdisciplinary content in a digital environment were initially at a similarly low level among prospective teachers in both the control (CG) and experimental (EG) groups. 65–70% of the students used digital resources merely as consumers and lacked the skills to design projects that integrated these resources.

• Final results of the experiment (Formative stage): Following the implementation of a specially developed methodological system and a dedicated course on creating digitally integrated content, the performance indicators of students in the experimental group improved dramatically. Specifically, there was a significant increase in the proportion of students demonstrating high and medium levels of pedagogical competence within the experimental group.

Practical Recommendations

1- Start simply: Begin by linking two subjects together.

2- Increase interactivity: Incorporate engaging games and questions rather than relying solely on text.

3- Work in groups: Allow prospective teachers to create projects collaboratively.

DISCUSSION

The results obtained during the research indicate that designing and implementing interdisciplinary integrated content within a digital educational environment plays a crucial role in enhancing the professional preparedness and pedagogical skills of prospective teachers. Prior to the experimental phase (during the initial assessment stage), it was found that the majority of students lacked sufficient skills to create digital content that establishes interdisciplinary connections. Students were primarily accustomed to using existing digital resources and faced difficulties in creating interactive assignments, electronic textbooks, or multimedia products that integrated their specific subject with related disciplines.[8] During the subsequent formative experiment, a specially developed interdisciplinary integrated methodological system was introduced into the educational process. During this process, prospective teachers independently created integrated educational content using LMS systems, digital authoring tools, and multimedia resources. The results of the discussion demonstrated that project-based learning and a competency-based approach rapidly developed not only the students' ICT literacy but also key elements of pedagogical skill, such as critical thinking, creative approaches, and professional mobility.

The process of creating interdisciplinary integrated digital content—aimed at enhancing the pedagogical skills of prospective teachers—consists of several stages:

• Design stage: Identifying common concepts and shared aspects among the subjects to be integrated (e.g., STEM disciplines) and defining learning objectives.

• Content digitization: Transforming textual information into formats such as video lessons, infographics, podcasts, virtual reality (VR) elements, and interactive quizzes.

• Practical testing: Applying the created content during pedagogical practice to evaluate its educational effectiveness and make necessary adjustments.[10]

CONCLUSION

In conclusion, the creation and implementation of interdisciplinary integrated content within a digital educational environment serve as a strategic factor that elevates the professional training of future teachers to a qualitatively new, modern level. In today’s rapidly evolving information landscape,

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educators are required to go beyond deep knowledge of a specific subject; they must be able to explain complex processes at the intersection of multiple disciplines, design the educational process using digital technologies, and foster critical and creative thinking among students. Digital educational environments and advanced international practices play a vital role in developing pedagogical expertise. The effective use of digital technologies and the integration of interactive methods into the educational process are key tools for enhancing teachers' professional capabilities; they transform students' approaches to learning and encourage independent thinking. International experience demonstrates that advanced approaches to teacher professional development serve to improve the quality not only of the educators themselves but of the entire educational process. The education systems of countries such as Finland, Singapore, the United Kingdom, and the USA place special emphasis on the professional development of teachers. The experiences of these nations can be adapted to Uzbekistan's education system and prove beneficial in further enhancing pedagogical skills. Continuously developing teachers, introducing them to new methods and technologies, and facilitating the exchange of experience with leading educators are crucial steps toward improving the quality of education.

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