MECHANISMS FOR DEVELOPING ORGANIZATIONAL AND METHODOLOGICAL COMPETENCE THROUGH VIRTUAL LEARNING TECHNOLOGIES

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The rapid development of digital technologies and the transformation of higher education have created new requirements for the professional preparation of future teachers. In this context, the development of organizational and methodological competence has become an essential component of teacher education. This article examines the theoretical and methodological foundations of developing organizational and methodological competence through virtual learning technologies. The study aims to identify the pedagogical mechanisms that integrate virtual learning environments, pedagogical modelling, and virtual imagination into the professional preparation of future teachers. The research employs theoretical analysis, comparative analysis, systems-based approaches, pedagogical modelling, and conceptual synthesis. Five interconnected mechanisms are proposed: motivational-activating, cognitive-integrative, design-modelling, diagnostic-evaluative, and reflective-corrective. Furthermore, a conceptual model is developed to demonstrate the relationship between pedagogical objectives, virtual learning technologies, simulated professional activities, and competency-based outcomes. Particular attention is given to virtual imagination as a methodological instrument that enables prospective teachers to anticipate pedagogical situations, explore alternative solutions, and make informed methodological decisions. The findings provide a theoretical basis for designing technology-enhanced teacher education programmes and developing the organizational and methodological competence of future educators.

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1 Introduction

The transformation of higher education in the twenty-first century is closely associated with the development of digital technologies, artificial intelligence, immersive learning environments, and innovative pedagogical ap-

proaches. These developments are changing not only the content of education but also the organization, management, and methodological foundations of teaching and learning. Contemporary educational environments require future teachers to possess more than subject-specific knowledge. They must be capable of designing educational processes, selecting appropriate teaching methods, organizing collaborative activities, managing pedagogical situations, and evaluating learning outcomes. Consequently, organizational and methodological competence represents an important dimension of professional teacher preparation. It reflects the ability of a future teacher to plan, organize, implement, monitor, and improve educational activities in accordance with pedagogical objectives and learners' needs. However, traditional approaches to teacher education do not always provide sufficient opportunities for students to practise complex pedagogical situations before entering professional practice. Theoretical knowledge may remain disconnected from the practical skills required to manage real educational environments.

Virtual learning technologies offer new opportunities to address this challenge. Virtual classrooms, immersive simulations, interactive digital platforms, and three-dimensional modelling environments allow students to engage with simulated educational situations and practise professional decision-making in controlled learning environments. According to Mishra and Koehler (2006), effective technology integration requires the interaction of technological, pedagogical, and content knowledge. This perspective demonstrates that technology should not be treated as an independent element of education but as an integral component of pedagogical practice. Similarly, Redecker (2017), through the European Framework for the Digital Competence of Educators (DigCompEdu), emphasizes the importance of educators' digital competence in planning, implementing, and evaluating educational activities.

Recent research also demonstrates the growing importance of virtual reality in teacher education. Han et al. (2025) examined the application of virtual reality in teacher preparation through a systematic review and meta-analysis, highlighting its potential for supporting professional learning. Nevertheless, the educational effectiveness of virtual technologies depends not only on

their technical characteristics but also on the pedagogical mechanisms through which they are integrated into the learning process. The research problem addressed in this article concerns the need to develop a systematic pedagogical framework that connects virtual learning technologies with the development of organizational and methodological competence. The purpose of the study is to theoretically substantiate the mechanisms for developing organizational and methodological competence through virtual learning technologies and to propose an integrated pedagogical model for their implementation in higher education. The study addresses the following research questions:

- What pedagogical opportunities do virtual learning technologies provide for developing organizational and methodological competence?
- Which pedagogical mechanisms ensure the effective integration of virtual learning technologies into teacher education?
- How can virtual imagination and pedagogical modelling contribute to the development of professional methodological decision-making?

2 Materials and methods

The study is based on theoretical and methodological analysis of scientific literature related to digital pedagogy, teacher education, virtual learning environments, professional competence, and pedagogical modelling. The methodological framework incorporates the following approaches:

Systems approach. This approach considers organizational and methodological competence as an integrated structure consisting of interconnected knowledge, skills, professional attitudes, and reflective abilities. Competence-based approach. It focuses on the development of professional abilities required for planning, organizing, implementing, and evaluating educational activities. Activity-based approach. It emphasizes students' active participation in simulated pedagogical situations, practical assignments, and independent methodological decision-making. Technology-oriented approach. It examines the pedagogical integration of virtual environments, interactive simulations, digital

resources, and immersive technologies. The following research methods were applied:

- theoretical analysis of pedagogical and methodological literature;
- comparative analysis of existing approaches to digital teacher competence;
- synthesis and generalization of scientific concepts;
- pedagogical modelling;
- conceptual analysis of the relationship between virtual learning technologies and professional competence development.

The study is conceptual and theoretical in nature. It does not report empirical intervention data or statistical measurements. Its primary contribution is the development of a theoretically grounded system of pedagogical mechanisms and an integrated conceptual model.

2.1 Conceptual understanding of organizational and methodological competence

Organizational and methodological competence is defined in this study as an integrative professional characteristic of a future teacher that enables the purposeful planning, organization, methodological support, implementation, management, and evaluation of educational activities. Its development involves several interconnected dimensions:

- Motivational dimension – professional interest, responsibility, and readiness to apply innovative educational approaches.
- Cognitive dimension – knowledge of pedagogical principles, teaching methods, digital technologies, and educational design.
- Operational dimension – the ability to select and apply appropriate methods, tools, and organizational forms.
- Activity dimension – the practical ability to design and implement educational activities and solve pedagogical problems.
- Reflective dimension – the ability to analyse professional actions, evaluate outcomes, and improve methodological decisions.

These dimensions provide the conceptual basis for designing a comprehensive system of competence development.

3 Results

3.1 Pedagogical opportunities of virtual learning technologies

Virtual learning technologies create conditions for integrating theoretical knowledge with simulated professional activities. Their pedagogical potential is particularly evident in the following areas:

Pedagogical situation modelling. Virtual environments allow students to encounter simulated classroom situations, identify problems, and develop appropriate methodological responses. Interactive professional learning. Students can participate in virtual discussions, collaborative assignments, and scenario-based learning activities. Methodological experimentation. Future teachers can test different instructional strategies and compare their potential outcomes without directly affecting real educational processes. Individualized learning trajectories. Virtual environments can provide differentiated assignments according to students' levels of preparation and professional development needs. Reflective learning. Digital portfolios, recorded simulations, and analytical assignments enable students to examine their decisions and evaluate their professional progress. However, the presence of technology alone does not guarantee the development of professional competence. As UNESCO (2023) emphasizes, the educational value of technology depends on its appropriate use and alignment with learning objectives.

Therefore, virtual technologies should be integrated into pedagogically meaningful activities rather than used merely as instruments for presenting information.

3.2 Mechanisms for developing organizational and methodological competence

Based on the theoretical analysis, five interconnected pedagogical mechanisms are proposed

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3.2.1 Motivational-activating mechanism

This mechanism aims to develop students' professional motivation, interest in innovative teaching practices, and readiness to use virtual learning technologies. Its implementation may involve:

- problem-based learning situations;
- interactive virtual assignments;
- professional challenges;
- virtual educational scenarios;
- collaborative learning activities.

The mechanism establishes the motivational foundation for independent professional development.

3.2.2 Cognitive-integrative mechanism

This mechanism focuses on integrating pedagogical knowledge, methodological principles, digital technologies, and educational design. Students develop an understanding of how technological resources can be selected and applied according to specific pedagogical objectives. Its implementation includes:

- studying digital pedagogical tools;
- analysing virtual learning environments;
- comparing instructional methods;
- examining pedagogical scenarios;
- integrating technological and methodological knowledge.

The mechanism contributes to the development of a comprehensive understanding of technology-supported teaching.

3.2.3 Design-modelling mechanism

The design-modelling mechanism is directed towards developing students' practical abilities to design educa-

tional activities and model pedagogical situations. Within virtual environments, students can:

- construct virtual classroom scenarios;
- develop interactive learning assignments;
- simulate pedagogical conflicts;
- design educational activities;
- select appropriate methodological solutions;
- predict possible learning outcomes.

An important methodological element of this mechanism is virtual imagination. Virtual imagination enables future teachers to mentally construct possible educational situations, anticipate their development, and explore alternative pedagogical solutions. In this context, virtual imagination is considered a methodological instrument that supports pedagogical modelling and professional decision-making.

3.2.4 Diagnostic-evaluative mechanism

This mechanism ensures the identification and assessment of students' competence development. It involves:

- diagnostic pedagogical assignments;
- assessment of methodological decisions;
- analysis of simulated teaching activities;
- digital portfolios;
- competency-based assessment criteria;
- evaluation of individual learning progress.

The mechanism provides information about students' strengths, methodological difficulties, and areas requiring further development.

3.2.5 Reflective-corrective mechanism

The reflective-corrective mechanism focuses on analysing professional activities and improving methodological decisions. Students examine their performance, identify errors, evaluate the effectiveness of selected methods, and develop alternative solutions. Its implementation includes:

- reflective diaries;
- self-assessment;
- peer assessment;

- analysis of virtual teaching sessions;
- corrective methodological assignments;
- individual professional development plans.

Mechanism	Focus of the mechanism	Result for the future teacher
Motivational-activating	Professional motivation, interest in innovative teaching practices, readiness to use virtual learning technologies	Motivational foundation for independent professional development
Cognitive-integrative	Integration of pedagogical knowledge, methodological principles, digital technologies and educational design	Comprehensive understanding of technology-supported teaching
Design-modelling	Design of educational activities and modelling of pedagogical situations in virtual environments	Practical ability to construct and anticipate pedagogical situations
Diagnostic-evaluative	Identification and assessment of the level of competence development	Information about strengths, methodological difficulties and areas for development
Reflective-corrective	Analysis of professional activity and improvement of methodological decisions	Ability to identify errors, evaluate methods and develop alternative solutions

Table 1 Pedagogical mechanisms for developing organizational and methodological competence

3.3 The methodological role of virtual imagination and pedagogical modelling

One of the distinctive aspects of the proposed approach is the integration of virtual imagination into the development of organizational and methodological competence. Virtual imagination is interpreted as the ability to mentally construct, visualize, and anticipate possible pedagogical situations within a virtual or digitally modelled educational environment. It enables future teachers to move beyond passive observation and engage in prospective pedagogical thinking. For example, a student may encounter a simulated classroom situation involving different learner behaviours, communication difficulties, or organizational challenges. The student analyses the situation, identifies its causes, develops several possible methodological solutions, selects the most appropriate approach, and evaluates the expected consequences.

This process involves several interconnected intellectual and professional activities:

- identification of a pedagogical problem;
- visualization of the educational situation;
- anticipation of possible developments;
- construction of alternative methodological solutions;
- selection of an appropriate pedagogical strategy;
- evaluation and reflection.

Thus, virtual imagination functions as a methodological instrument, while pedagogical modelling provides the practical framework for transforming imagined situations into structured professional activities.

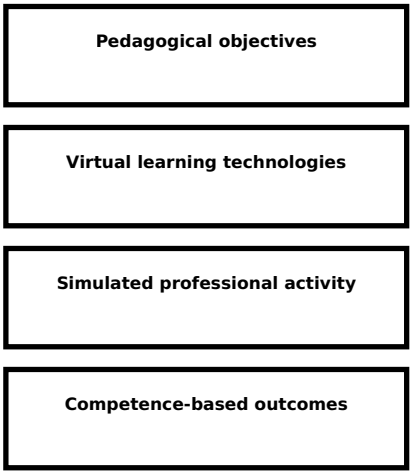


Figure 1 Conceptual model of competence development through virtual learning technologies

4 Discussion and conclusion

The findings of this conceptual study demonstrate that the development of organizational and methodological competence requires an integrated approach combining pedagogical knowledge, technological resources, practical activities, and reflective processes. The proposed framework is consistent with the Technological Pedagogical Content Knowledge model developed by Mishra and Koehler (2006), which emphasizes the interdependence of technology, pedagogy, and subject

content. However, the present approach extends this perspective by focusing specifically on the mechanisms through which virtual learning technologies can support the development of organizational and methodological competence. The proposed model also corresponds to the principles of DigCompEdu (Redecker, 2017), particularly in relation to digital teaching resources, teaching and learning activities, assessment, and the development of learners' digital competence. Furthermore, Kolb's (1984) experiential learning theory provides a theoretical basis for understanding the relationship between practical experience, reflection, and the construction of professional knowledge.

Recent research provides additional support for the relevance of virtual simulation in teacher preparation. Han et al. (2025) systematically reviewed the application of virtual reality in teacher education. Hong, Eom, and Moon (2025) also identified the potential of virtual reality simulations for supporting authentic learning in pre-service teacher education. At the same time, these studies highlight important limitations, including insufficient integration of authentic assessment, collaboration, and continuous feedback into virtual learning activities. This reinforces the central argument of the present study: the educational effectiveness of virtual technologies depends on the quality of their pedagogical and methodological integration. The proposed five-mechanism system addresses this issue by connecting motivation, knowledge integration, pedagogical modelling, diagnostic assessment, and reflection within a unified framework.

An important contribution of the study is the methodological interpretation of virtual imagination as a means of anticipating and modelling pedagogical situations. Unlike approaches that focus primarily on the technical use of virtual environments, this framework emphasizes the transformation of virtual experiences into professional methodological decisions. Nevertheless, the proposed model has certain limitations. Its effectiveness has not yet been established through a controlled empirical experiment. Further research should examine its implementation in teacher education programmes, develop measurable assessment indicators, and evaluate changes in students' organizational and methodological competence. The study theoretically substantiates the pedagogical mechanisms for develop-

ing organizational and methodological competence through virtual learning technologies in higher education. The analysis demonstrates that virtual learning technologies provide opportunities to connect theoretical knowledge with simulated professional activities, pedagogical problem-solving, methodological design, and reflective evaluation.

Five interconnected mechanisms have been identified and theoretically justified: motivational-activating, cognitive-integrative, design-modelling, diagnostic-evaluative, and reflective-corrective. An integrated conceptual model has also been proposed, consisting of target, content, technological, activity, and evaluation-outcome components. A distinctive methodological contribution of the study is the integration of virtual imagination and pedagogical modelling into the process of professional competence development.

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Biography:

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