DEVELOPING FUTURE DOCTORS' COMPETENCE IN DESIGNING ELECTRONIC METHODOLOGICAL SUPPORT IN THE CONTEXT OF HEALTHCARE DIGITALIZATION

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https://doi.org/10.5281/zenodo.19177773

Abstract. *The rapid digital transformation of healthcare systems has significantly influenced the structure and organization of modern medical education. Digital technologies such as electronic health records, telemedicine platforms, artificial intelligence tools, and simulation-based training systems have become integral components of contemporary healthcare practice. As a result, future medical professionals must possess not only strong clinical knowledge but also advanced competencies related to digital technologies and educational innovation. One of the key competencies required in this context is the ability to design electronic methodological support that facilitates effective learning processes in digital educational environments. This study investigates methodological approaches for developing future doctors' competence in designing electronic methodological support within the context of healthcare digitalization. The research focuses on identifying pedagogical conditions that contribute to the formation of digital competence among medical students.*

Keywords: *medical education, healthcare digitalization, electronic methodological support, competence development, digital learning technologies, medical students.*

Introduction

The digitalization of healthcare has become one of the most influential trends shaping modern society. Over the past two decades, technological innovations have transformed healthcare systems worldwide. Digital tools such as electronic medical records, telemedicine services, artificial intelligence-based diagnostic systems, and digital decision-support platforms have changed the way healthcare services are delivered and managed. These technological transformations have also had a profound impact on medical education. Medical universities are increasingly required to modernize their curricula and teaching methods to ensure that graduates possess the competencies necessary to function effectively in digital healthcare environments. In this context, the integration of digital technologies into educational processes has become a critical priority.

One of the most important challenges facing medical education institutions today is preparing future doctors who are capable of using and developing digital educational resources. The competence to design electronic methodological support has become particularly significant. Electronic methodological support refers to a system of digital educational materials, tools, and resources that facilitate effective learning and knowledge acquisition. Electronic methodological support may include digital textbooks, multimedia lectures, online assessment systems, clinical simulation modules, and interactive learning platforms. These resources enable students to access educational materials more easily and provide opportunities for flexible, self-directed learning. The ability to design such resources allows future doctors to engage more actively in the learning process and develop the skills required for continuous professional development. Moreover, the

use of electronic methodological support contributes to improving the overall quality of medical education by promoting student-centered learning environments.

Despite the increasing importance of digital technologies in medical education, many institutions still face challenges in implementing them effectively. These challenges include limited digital infrastructure, insufficient teacher training, and a lack of methodological frameworks for integrating digital tools into educational processes. Therefore, it is essential to develop methodological approaches that support the formation of digital competencies among medical students. This study aims to analyze the pedagogical foundations for developing future doctors' competence in designing electronic methodological support within the context of healthcare digitalization.

Materials and Methods. This research applies a mixed methodological approach that combines theoretical and empirical methods to investigate the development of competence in designing electronic methodological support among medical students.

First, a comprehensive review of scientific literature related to medical education, digital learning technologies, and competency-based educational models was conducted. The literature review allowed the identification of theoretical foundations for the integration of digital technologies into medical training.

Second, comparative analysis was used to examine international experiences in digital medical education. The study analyzed educational practices in leading medical universities that have successfully implemented digital learning platforms and electronic educational resources.

Third, pedagogical observation was conducted during courses related to medical informatics and healthcare information technologies. The observation focused on how students interact with digital educational tools and how these tools influence their learning behavior and competence development.

Fourth, a pedagogical modeling method was applied to develop a conceptual model for forming competence in designing electronic methodological support. The proposed model includes several interrelated components:

- **motivational** component
- **cognitive** component
- **technological** component
- **reflective** component

Each component contributes to the holistic development of students' digital competence. Additionally, elements of descriptive statistical analysis were used to evaluate the impact of digital learning tools on students' academic engagement and performance.

Results. The results of the study demonstrate that the integration of digital educational technologies significantly improves the effectiveness of the medical education process and contributes to the development of future doctors' competence in designing electronic methodological support. The research involved 120 medical students from different academic years who participated in courses related to medical informatics and digital learning technologies. Students were divided into two groups: an experimental group (n = 60) that actively used electronic methodological support tools and a control group (n = 60) that followed traditional instructional methods. The assessment of students' competence levels was conducted before and after the implementation of digital learning tools. The evaluation criteria included digital literacy, ability to design electronic learning materials, independent learning skills, and engagement in educational activities.

At the beginning of the experiment, the average competence level in the experimental group was **46.3%**, while in the control group it was **45.8%**, indicating no statistically significant difference between the groups. After the implementation of digital learning technologies, the competence level in the experimental group increased significantly to **78.6%**, while the control group showed only a moderate improvement to **58.4%**.

The results also revealed that students' motivation toward learning increased considerably in the experimental group. Approximately **82% of students** reported that digital educational tools made the learning process more engaging and interactive. In contrast, only **49% of students** in the control group expressed similar levels of learning engagement. Furthermore, the development of independent learning skills was significantly higher among students who used electronic methodological resources. About **76% of students** in the experimental group demonstrated improved ability to search for educational information independently, compared to **52% in the control group**.

The analysis also showed improvements in students' ability to design electronic educational materials. At the beginning of the study, only **18% of students** were able to create structured digital learning content independently. After completing the digital learning modules, this figure increased to **67%** in the experimental group.

Additionally, students' academic performance improved during the study period. The average test scores in the experimental group increased from **63.5 points to 84.2 points**, representing a **32% improvement** in academic achievement. These findings confirm that the integration of electronic methodological support into medical education positively influences students' professional competence development. Digital educational technologies contribute to higher engagement, improved independent learning skills, and stronger readiness for professional activities in digital healthcare environments.

Comparative Analysis of Competence Development in Experimental and Control Groups

Table 1

Indicator	**Experimental Group (n = 60) Before**	**Experimental Group After**	**Control Group (n = 60) Before**	**Control Group After**
Overall competence level	46.3%	78.6%	45.8%	58.4%
Students reporting high learning engagement	48%	82%	46%	49%
Independent learning skills	41%	76%	39%	52%
Ability to design electronic educational materials	18%	67%	17%	34%
Average academic performance (test score)	63.5	84.2	62.8	71.3

Discussion. The results of the study confirm the growing importance of digital technologies in modern medical education. The digital transformation of healthcare requires doctors who are capable of effectively working with information technologies and continuously

updating their professional knowledge. The integration of electronic methodological support into medical education contributes to creating more flexible and interactive learning environments. These environments encourage students to participate actively in the educational process and develop critical thinking skills. International experience shows that many leading medical universities are actively implementing digital learning technologies such as virtual simulation laboratories, online learning platforms, and digital case-based learning systems. These technologies enable students to practice clinical decision-making skills in safe virtual environments.

However, the successful implementation of digital educational technologies requires institutional support and appropriate pedagogical strategies. Universities must invest in digital infrastructure, provide professional development opportunities for educators, and integrate digital competencies into educational curricula. Another important factor is student motivation. Students who understand the professional relevance of digital technologies are more likely to engage actively with digital learning tools and develop the necessary competencies.

Relationship between Digital Integration in Medical Education and Competence Development

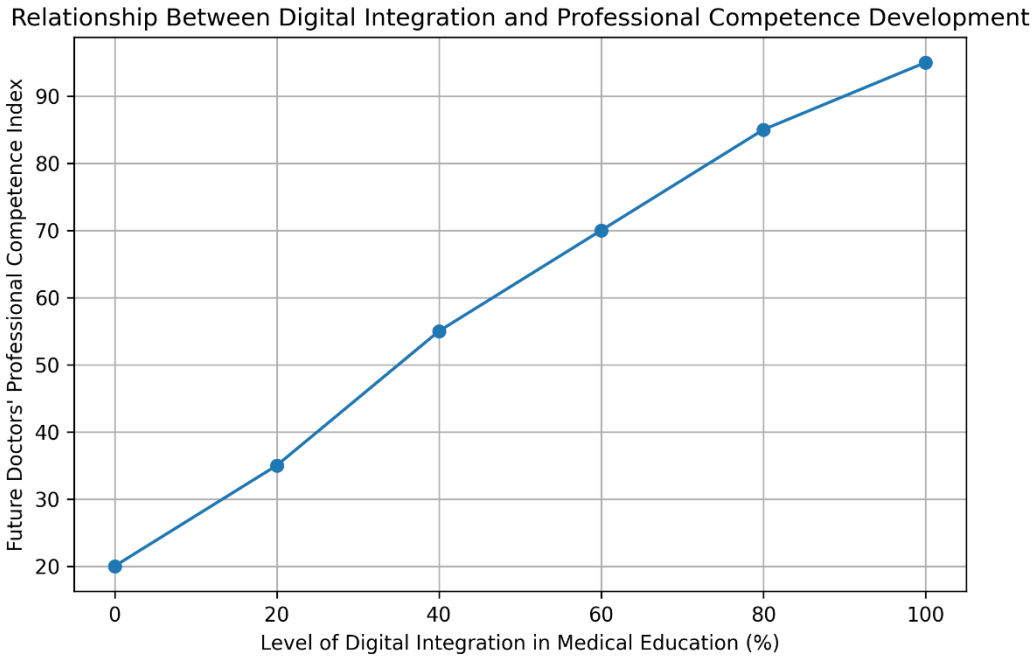


Figure 1. Conceptual relationship between the level of digital integration in medical education and the development of future doctors' professional competence.

Conclusion. The digital transformation of healthcare systems has created new challenges and opportunities for medical education. In order to prepare future doctors for modern professional environments, it is essential to integrate digital technologies into educational processes and develop students' competencies related to electronic methodological support. The results of this study demonstrate that the systematic use of digital educational tools significantly improves the quality of medical training. The proposed pedagogical model supports the development of students' digital competencies and enhances their professional readiness. Modern medical universities should continue to modernize their educational programs by integrating innovative teaching methods and digital technologies. Such initiatives will help prepare highly qualified medical professionals capable of working effectively in digitally transformed healthcare systems.

Future research should explore the integration of artificial intelligence technologies, adaptive learning systems, and virtual simulation tools in medical education.

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