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# TRANSFORMATION OF THE ROLE OF THE PROFESSOR THROUGH THE DEVELOPMENT OF DIGITAL TOOLS AND THE APPLICATION OF ARTIFICIAL INTELLIGENCE

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***Keywords**: digital education, professor, artificial intelligence, digital tools, teaching, educational technologies.*

**Abstract:** *Contemporary society is characterized by the rapid development of information and communication technologies, which significantly affect all spheres of life, including education. Digitization of the educational process has led to changes in the ways of acquiring knowledge, communication between teachers and students, as well as the organization of teaching. The application of artificial intelligence (AI), which enables personalized learning, the automation of certain teaching activities and the improvement of educational outcomes, has gained special importance in recent years. The digital transformation of education represents one of the most significant processes affecting modern education systems. The development of information and communication technologies, digital platforms and artificial intelligence has led to significant changes in the way teaching is organized, communication between teachers and students, as well as the process of acquiring knowledge. In such circumstances, the traditional role of the professor is also changing. The teacher is no longer exclusively a source of information, but becomes a mentor, facilitator, organizer of the learning process and a guide through the complex digital educational space. The application of artificial intelligence, which enables personalized learning, automation of certain teaching activities and more effective monitoring of student progress, is of particular importance. The aim of this paper is to analyze the transformation of the role of the professor due to the development of digital tools and the application of artificial intelligence, as well as to consider the advantages, challenges and future perspectives of digital education.*

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# TRANSFORMACIJA ULOGE PROFESORA KROZ RAZVOJ DIGITALNIH ALATA I PRIMJENU VJEŠTAČKE INTELIGENCIJE

***Ključne riječi:*** *digitalno obrazovanje, profesor, vještačka inteligencija, digitalni alati, nastava, obrazovne tehnologije.*

**Sažetak:** *Savremeno društvo karakteriše ubrzan razvoj informaciono-komunikacionih tehnologija, koje značajno utiču na sve sfere života, uključujući i obrazovanje. Digitalizacija obrazovnog procesa dovela je do promjena u načinima sticanja znanja, komunikaciji između nastavnika i studenata, kao i u organizaciji nastave. Poseban značaj posljednjih godina dobija primjena vještačke inteligencije (VI), koja omogućava personalizovano učenje, automatizaciju određenih nastavnih aktivnosti i unapređenje obrazovnih ishoda. Digitalna transformacija obrazovanja predstavlja jedan od najznačajnijih procesa koji utiču na savremene obrazovne sisteme. Razvoj informaciono-komunikacionih tehnologija, digitalnih platformi i vještačke inteligencije doveo je do značajnih promjena u načinu organizovanja nastave, komunikaciji između nastavnika i studenata, kao i u procesu sticanja znanja. U takvim okolnostima mijenja se i tradicionalna uloga profesora. Nastavnik više nije isključivo izvor informacija, već postaje mentor, facilitator, organizator procesa učenja i vodič kroz složeno digitalno obrazovno okruženje. Poseban značaj ima primjena vještačke inteligencije, koja omogućava personalizovano učenje, automatizaciju određenih nastavnih aktivnosti i efikasnije praćenje napretka studenata. Cilj ovog rada je analizirati transformaciju uloge profesora usljed razvoja digitalnih alata i primjene vještačke inteligencije, kao i razmotriti prednosti, izazove i buduće perspektive digitalnog obrazovanja.*

## 1. Introduction

The traditional role of the professor as the primary source of knowledge is gradually evolving into that of a mentor, facilitator, and organizer of the learning process. In contemporary education, professors are no longer the sole providers of information; rather, they guide students in locating, critically evaluating, interpreting, and applying knowledge. The development of digital technologies and the rapid advancement of artificial intelligence (AI) have accelerated this transformation and introduced significant changes across nearly all areas of society, including education.

Modern educational systems face new opportunities and challenges arising from the integration of intelligent technologies into teaching and learning. Artificial intelligence is changing the ways in which knowledge is accessed, processed, and communicated, thereby redefining the traditional roles of participants in the educational process. In this context, particular attention should be given to the transformation of the professor's role. The increasing availability of information, digital learning environments, and AI-based tools enables students to participate more independently in the learning process. Consequently, the professor increasingly assumes the role of a mentor and facilitator who supports students in navigating complex information environments, developing critical thinking skills, and applying acquired knowledge appropriately.

The application of artificial intelligence also creates opportunities for the personalization of teaching, the adaptation of educational content to individual student needs, and more effective monitoring of student progress. Furthermore, the automation of certain

administrative and assessment-related tasks may provide professors with additional time for pedagogical, creative, and student-centered activities. However, the integration of AI into education also raises important questions concerning ethics, data privacy, educational quality, academic integrity, and the preservation of the human dimension of teaching and learning. The professor's role therefore becomes increasingly complex, requiring not only pedagogical expertise but also digital competencies and the ability to evaluate technological tools critically.

In addition to technological knowledge, professors are expected to develop and maintain competencies that artificial intelligence cannot fully replicate, including empathy, interpersonal communication, motivation, professional judgment, and the ability to foster critical and independent thinking. These competencies are becoming increasingly important for maintaining the quality and human-centered nature of education in the digital age. Artificial intelligence should therefore not be regarded as a replacement for professors, but rather as a technological tool that, when used appropriately and responsibly, can support their work and contribute to the effectiveness of teaching and learning.

These developments also require a reconsideration of teachers' professional identity and responsibilities within contemporary educational environments. Understanding the transformation of the professor's role is important for the future development of educational institutions, teaching practices, and professional competencies. An analysis of this transformation can contribute to a better understanding of the relationship between technology and education and help identify the competencies that educators will need in increasingly digitalized learning environments. In the age of artificial intelligence, the professor remains a central participant in the educational process, although the methods, competencies, and responsibilities associated with this role are undergoing substantial change. For this reason, the transformation of the professor's role represents an important issue in contemporary education.

## 2. Development of digital tools in the teaching process

The development of digital tools has significantly transformed the way the teaching and learning process is organized and implemented. Digital technologies have become an integral part of contemporary education, facilitating access to knowledge, supporting communication between professors and students, and enabling greater flexibility in the organization of teaching. Whereas professors were traditionally among the primary sources of academic information, students today have access to a wide range of educational resources through the Internet, digital libraries, educational platforms, and other online sources. Consequently, the professor's role is increasingly shifting from the transmission of information toward the guidance, organization, and facilitation of the learning process.

Digital tools such as learning management systems, presentation software, interactive whiteboards, videoconferencing platforms, and collaborative applications can contribute to more dynamic and interactive teaching. Learning management systems (LMS) are particularly important because they enable professors to organize and distribute teaching materials, assign tasks, communicate with students, monitor participation, and manage assessment activities within an integrated digital environment. Videoconferencing platforms have further expanded the possibilities of distance and hybrid education, demonstrating

that teaching and learning are no longer necessarily limited to traditional classrooms or lecture halls.

Interactive quizzes, educational applications, multimedia resources, and other forms of digitally supported learning can encourage greater student participation and engagement. By incorporating elements of interaction, immediate feedback, and, where appropriate, gamification, these tools can make the learning process more engaging and encourage students to assume greater responsibility for their own learning. Digital technologies can therefore support a transition from predominantly teacher-centered instruction toward more flexible and student-centered approaches to education.

One of the major advantages of digital technologies is their potential to adapt teaching and learning activities to students' individual needs. Students can learn at their own pace, revisit content they have not fully understood, and use additional resources to deepen their knowledge. Professors, in turn, can use digital tools to monitor student progress more systematically and identify areas in which additional support may be required. Digital technologies can also facilitate the visualization of complex concepts through animations, simulations, interactive models, and multimedia content, thereby providing additional ways of presenting and understanding educational material.

A particularly important development is the increasing use of tools based on artificial intelligence. AI-based applications can support professors in preparing teaching materials, generating assessment items, analyzing student performance, providing feedback, and developing personalized learning recommendations. Such applications can reduce the time required for certain routine tasks and provide additional information that may assist professors in making pedagogical decisions. However, the use of AI in education also requires critical evaluation of the accuracy, reliability, transparency, and appropriateness of AI-generated content.

Despite these technological possibilities, digital tools and artificial intelligence should not be regarded as substitutes for professors. Human interaction, empathy, motivation, professional judgment, contextual understanding, and pedagogical support remain essential components of the educational process. Technology should therefore function as a means of enhancing teaching and learning rather than as an end in itself. The effectiveness of digital transformation depends not only on the availability of technological tools but also on professors' ability to select and use them appropriately, critically, and responsibly.

The continuing development of digital technologies consequently requires the ongoing professional development of teaching staff. Professors need to strengthen their digital and AI-related competencies in order to integrate emerging technologies effectively into their teaching practices. At the same time, educational institutions should promote students' digital and information literacy, particularly their ability to evaluate the credibility, relevance, and accuracy of information obtained from digital sources. The future development of education is therefore likely to depend on the effective integration of human expertise, pedagogical knowledge, and technological capabilities. The greatest potential of digital tools lies not in replacing professors, but in supporting the development of a more accessible, flexible, interactive, and effective educational process.

## 3. Digital education - advantages and challenges

Digital education represents one of the most significant developments in contemporary educational systems. It can make knowledge and educational resources more accessible to a broader range of learners, regardless of their geographical location, age, or personal circumstances. Through digital technologies, students can access educational content at different times and from different locations, thereby increasing the flexibility of the learning process. Such flexibility is particularly important for students who are employed, live far from educational institutions, or have other responsibilities that may limit their ability to attend classes regularly.

One of the major advantages of digital education is the possibility of adapting the learning process to individual student needs. Students can learn at their own pace, revisit content they have not fully understood, and explore topics of particular interest in greater depth. Digital tools also enable the integration of video materials, simulations, interactive activities, and multimedia content, which can provide different ways of presenting and understanding complex concepts. At the same time, professors can use digital platforms to monitor student progress more systematically and adapt teaching activities to identified learning needs.

Digital education also contributes to the development of digital competencies that are increasingly important in contemporary professional environments. By using digital platforms and educational technologies, students develop skills related to information retrieval, digital communication, independent learning, and the responsible use of technological resources. Furthermore, digital tools can facilitate communication between professors and students and simplify the distribution and exchange of teaching materials.

Despite these advantages, digital education also presents a number of challenges. One of the most important is the potential reduction in direct social interaction. In traditional classrooms and lecture halls, students develop interpersonal communication skills, collaborate with their peers, and establish a sense of belonging to an academic community. These aspects of education may be more difficult to maintain in a fully digital learning environment. Consequently, digital education should be designed in a way that preserves meaningful interaction among students and between students and professors.

Another challenge concerns prolonged exposure to digital devices. Extensive use of computers, tablets, and smartphones may contribute to fatigue and reduced concentration, particularly when digital learning activities are not appropriately structured. In addition, students do not necessarily have equal access to reliable Internet connections, suitable devices, or appropriate learning environments. Such differences may contribute to a digital divide and create additional inequalities in access to educational opportunities.

The extensive amount of information available online also places greater responsibility on students to evaluate information critically. Access to information does not necessarily imply access to reliable knowledge. Students therefore need to develop information and digital literacy skills that enable them to assess the credibility, relevance, and accuracy of online sources. In this respect, the professor retains an important role in guiding students toward the responsible and critical use of digital information.

The increasing reliance on digital technologies also emphasizes the importance of professional and ethical responsibility. Ethical principles and professional codes provide

frameworks for establishing commonly recognized values and standards that guide professional conduct. Donev and Vojinović (2023) emphasize the importance of ethical codes in establishing and maintaining professional values and principles. Although their analysis focuses on journalism, the underlying principle of professional responsibility is also relevant to the educational context, particularly when considering the responsible use of digital technologies and artificial intelligence. In digital education, clearly defined ethical principles are increasingly important in relation to data protection, the responsible use of information, academic integrity, transparency, and the appropriate application of AI-based tools.

Digital education should therefore not be understood as a replacement for traditional education, but rather as an opportunity to complement and enhance existing teaching practices. A balanced approach that combines the flexibility and accessibility of digital technologies with direct human interaction and established pedagogical principles may provide a more comprehensive learning experience. Technology can facilitate access to knowledge and support the organization of teaching, but professional guidance, motivation, communication, and interpersonal understanding remain essential components of high-quality education. The future development of education is therefore likely to depend on the effective integration of digital opportunities with human-centered pedagogical practices.

## 4. Application of artificial intelligence in the educational process

Artificial intelligence (AI) has become an increasingly important component of contemporary education and is being used by both students and professors to support different aspects of teaching and learning. Generative AI tools can assist students in explaining complex concepts, summarizing academic literature, generating and organizing ideas, improving language and grammar, supporting academic writing, and solving certain technical and programming tasks. AI can also function as a personalized learning support tool by providing immediate feedback and additional explanations adapted to students' questions and learning needs.

Research on the use of generative AI in higher education indicates that students employ AI tools for a variety of academic purposes, including summarizing texts, brainstorming, organizing ideas, understanding course content, and receiving feedback on their work. At the same time, the use of these technologies raises important concerns regarding over-reliance on AI, the potential weakening of independent critical thinking, and the use of AI-generated information that may be incomplete, inaccurate, or misleading. Consequently, effective use of AI in education requires not only technical competence but also critical evaluation of AI-generated content and an understanding of the limitations of these systems.

Professors can use artificial intelligence to support the preparation of teaching materials, presentations, assessment tasks, examples, and learning activities, as well as to analyze student performance and provide feedback. AI-assisted tools may also reduce the time required for certain routine and administrative activities, potentially allowing professors to devote greater attention to pedagogical work, interaction with students, and the design of meaningful learning experiences. However, the integration of AI into teaching requires

professors to understand both the opportunities and the limitations associated with these technologies.

The transformation of the professor's role is particularly important in this context. The UNESCO *AI Competency Framework for Teachers* emphasizes a human-centered approach to AI and identifies 15 competencies across five dimensions: a human-centered mindset, ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional learning (Miao & Cukurova, 2024). The framework emphasizes the importance of protecting human agency and strengthening teachers' capacity to use AI ethically, critically, and effectively. It therefore positions teachers as central actors in decisions concerning the appropriate integration of artificial intelligence into education rather than as passive users of technological systems.

To maintain this central professional role, professors should use AI as a supportive tool rather than as a substitute for professional and pedagogical judgment. Their contribution increasingly involves interpreting information, facilitating discussion, fostering critical thinking, evaluating student needs, and providing pedagogical and interpersonal support. AI systems can generate, organize, and analyze content, but their use in education should remain guided by human judgment, ethical responsibility, and clearly defined pedagogical objectives. UNESCO's framework similarly emphasizes human agency and accountability and recognizes the continuing importance of teachers in ensuring the ethical and effective adoption of AI in education (Miao & Cukurova, 2024).

Artificial intelligence should therefore be understood as a technology that can complement and enhance the work of professors rather than replace them. Its educational value depends on how appropriately it is integrated into teaching practices and whether its use contributes to meaningful learning outcomes. In this environment, the professor's role evolves from being predominantly a transmitter of information toward becoming a mentor, facilitator, critical evaluator, and designer of learning experiences. The effective integration of AI into education ultimately requires a balance between technological innovation and the preservation of human agency, professional responsibility, and pedagogical values.

## 5. Future perspectives of the use of artificial intelligence in teaching

The development of artificial intelligence opens new opportunities for the advancement of higher education and is gradually transforming traditional approaches to teaching and learning. The UNESCO AI Competency Framework for Teachers emphasizes the growing importance of AI-related competencies and the responsible, human-centered integration of artificial intelligence into educational practice (Miao & Cukurova, 2024). At the same time, higher education institutions are increasingly exploring the potential of AI technologies to enhance the quality, accessibility, and effectiveness of the educational process.

One of the most significant future directions is the further development of personalized learning. AI-based systems can support the analysis of students' learning needs, performance, and progress and can assist in adapting educational content, activities, and feedback accordingly. Such approaches may enable students to learn at a pace more appropriate to their individual needs and receive more targeted support throughout the learning process. However, the effective implementation of personalized learning requires careful consid-

eration of pedagogical objectives, data protection, transparency, and the role of human oversight (Holmes et al., 2022).

Intelligent tutoring systems and generative AI assistants are also likely to play an increasingly important role in higher education. These technologies can provide students with additional explanations, feedback, learning resources, and guidance in solving academic problems. Research on artificial intelligence in higher education has identified adaptive systems, personalization, assessment, and profiling among the important areas of AI application, while also highlighting the need for stronger involvement of educators in the development and evaluation of these technologies (Zawacki-Richter et al., 2019).

A broader application of artificial intelligence in assessment and the monitoring of student progress can also be expected. AI-supported systems may assist in analyzing assignments, assessments, and learning activities, thereby providing professors with additional information about student performance and areas in which further support may be required. In addition, the automation of certain routine tasks may reduce administrative workload and allow professors to devote more attention to pedagogical activities and direct interaction with students. Nevertheless, the use of AI in assessment requires professional oversight and careful consideration of transparency, fairness, reliability, and ethical responsibility (Celik et al., 2022).

Another important direction involves the integration of artificial intelligence with other emerging educational technologies, including virtual and augmented reality. Such technologies can contribute to the development of interactive simulations, virtual learning environments, and digital laboratories in which students can acquire knowledge and practice skills in controlled environments. These approaches may be particularly valuable in disciplines that require visualization, experimentation, or the development of practical competencies. More broadly, research on AI in education indicates that intelligent technologies have the potential to support increasingly adaptive and interactive forms of teaching and learning (Chen et al., 2020).

Despite the growing application of AI technologies, the professor remains a central actor in the educational process. The professor's role is gradually evolving from that of a primary transmitter of information toward that of a mentor, facilitator, learning designer, and professional who encourages critical thinking, creativity, collaboration, and ethical reasoning. Artificial intelligence can support these activities, but the pedagogical use of AI still requires human judgment, contextual understanding, and professional responsibility. A human-centered approach therefore requires that technological innovation strengthen rather than diminish the agency of professors and students (Cukurova, 2025; Miao & Cukurova, 2024).

The future of higher education is therefore likely to be characterized by increasing collaboration between professors and intelligent technologies. Artificial intelligence has the potential to support teaching quality, expand access to educational resources, facilitate personalized learning, and improve certain aspects of educational management. However, successful implementation will depend on the capacity of higher education institutions and professors to integrate AI responsibly, ethically, critically, and in accordance with clearly defined pedagogical objectives. The central challenge is therefore not whether artificial intelligence will become part of higher education, but how it can be integrated in a way that

preserves human agency, educational quality, academic integrity, and the essential pedagogical role of the professor.

## 6. Conclusion

The development of digital technologies and the increasingly widespread application of artificial intelligence have brought significant changes to the educational process, influencing both the ways in which knowledge is acquired and the role of professors in contemporary higher education. The traditional teaching model, in which the professor primarily served as a source and transmitter of information, is gradually evolving toward a more collaborative, interactive, and student-centered approach. Digital tools and AI-based systems can support more efficient teaching organization, improve access to educational resources, facilitate personalized learning, and enable faster communication among participants in the educational process.

Although these technologies offer considerable opportunities to enhance the quality and accessibility of education, they also introduce new challenges for professors and higher education institutions. Contemporary professors are expected not only to possess expertise in their academic disciplines but also to develop digital and AI-related competencies, critically evaluate information, and integrate emerging technologies into teaching in a pedagogically meaningful and ethically responsible manner. In this context, the role of the professor does not diminish; rather, it acquires new dimensions that include mentoring, facilitating learning, encouraging critical thinking, supporting students, and promoting the responsible and ethical use of technology.

Artificial intelligence can assist with certain administrative, analytical, and content-related tasks and provide students with additional learning support and access to information. However, its use does not eliminate the importance of human interaction in education. Empathy, communication, motivation, contextual understanding, professional judgment, and the ability to recognize individual student needs remain essential elements of the teaching profession. For this reason, AI should primarily be understood as a supportive technology that can enhance professors' work rather than as a substitute for their pedagogical and professional role.

The future of higher education is therefore likely to depend on effective collaboration between professors and intelligent technologies. The greatest potential of digital tools and artificial intelligence lies in their capacity to support professors in creating more flexible, accessible, interactive, and personalized learning environments while enabling students to engage with knowledge more independently and effectively. Successful digital transformation will depend on the ability of professors and higher education institutions to adopt technological innovations critically, preserve essential pedagogical values, and continuously develop the competencies required for education in the digital age.

Ultimately, the successful integration of artificial intelligence into higher education should be guided by a human-centered approach in which technology supports rather than replaces human agency (Miao & Cukurova, 2024). In this way, higher education can respond to the technological and social changes of the digital age while preserving the professor's essential role as a mentor, facilitator of learning, promoter of critical thinking, and contributor to students' intellectual and professional development.

## Literature


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### Webography


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