# PEDAGOGY

## THE PEDAGOGICAL TOOLS OF DIGITAL DIDACTICS

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**Abstract.** This article provides a theoretical analysis of two didactic methods: classical didactics and digital didactics. Classical didactics, as a branch of pedagogy, explores basic principles and teaching methods and emphasizes the role of the teacher in conveying given content and developing essential skills and competencies in students. In contrast, digital didactics is an emerging field that deals with the organization of educational processes in the context of the digital transformation of society. The primary goal is to craft learning experiences that leverage modern information technologies, emphasizing active, independent student engagement. The article highlights the key principles, pedagogical tools, and educational outcomes that differentiate classical from digital didactics. At the center of the article is an explicit description of the pedagogical tools of digital didactics. It contains verified examples of the implementation of digital didactics in the Russian education system. It is stated that digital didactics is a comprehensive approach to organizing the educational process. This approach encompasses personalized learning, broadening the academic context, gamification, online learning, the application of artificial intelligence, and the ongoing enhancement of the digital learning environment.

**Keywords:** *adaptive educational platforms, gamification of learning, artificial intelligence, keywords, massive open online courses, pedagogical tools of digital didactics, virtual simulators, digital didactics, digital transformation of education*

The importance of the issue arises from the objective need to adapt the education system to the requirements of the digital economy. According to the Decree of the President of the Russian Federation, "On

the national development goals of the Russian Federation for the period up to 2030" [1], digital transformation is an important goal in all areas of life, including education. However, the research on digital transformation in education in the scientific literature is still limited. Most studies are fragmented, focus on specific aspects of digitalization in education, and lack a unified didactic framework.

Classical didactics is a field within pedagogy that deals with the theory and practical application of teaching and learning [2]. It ensures effective teaching and learning while developing students' critical thinking skills. Traditional didactics focus on the role of the teacher in delivering prepared content, with the student taking a more passive role as a receiver of information [3].

In contrast, digital didactics is an emerging scientific field that deals with the organization of the educational process in the context of the digital transformation of society. The main goal of digital didactics is to organize the learning process through modern information technologies, focusing on active, independent learning of students [3, 4].

Let us outline the main principles, pedagogical tools, and educational outcomes that distinguish classical from digital didactics (Table 1).

Table 1

*Principles, pedagogical tools, and educational outcomes of classical and digital didactics*

| Parameter | Classical didactics | Digital didactics |
|---|---|---|
| Basic principles | – Scientific approach<br>– Systematic and consistent<br>– Visibility<br>– Accessibility | – Greater individualization<br>– Broadening of experience and deepening of knowledge<br>– Learning in a global context<br>– Feasibility of the use of digital technologies |
| Pedagogical tools | – Lectures<br>– Seminars<br>– Practical exercises<br>– Laboratory work | – Adaptive educational platforms<br>– Simulators and virtual simulators<br>– Gamification of learning<br>– Massive Open Online Courses (MOOCs)<br>– Artificial intelligence |
| Educational outcomes | – Subject knowledge and skills<br>– General learning skills | – Digital literacy<br>– Critical thinking<br>– Creativity<br>– Communication skills |

Digital didactics naturally extends foundational didactic principles, refining and expanding them to meet the evolving demands of the digital

economy and interconnected society. The main focus is on the personalization of learning, the expansion of students' educational experiences, and the development of relevant digital skills [5].

In today's educational practice, a trend toward the integration of elements from traditional and digital didactics can be observed. Traditional teaching methods, such as lectures and seminars, are increasingly combined with digital tools, such as interactive presentations, online tests, and virtual exercises. This hybrid approach enhances visualization and interactivity, facilitates the personalization of the learning process, and fosters the development of essential digital skills in students[6].

However, it is important to note that digital technologies do not automatically improve learning effectiveness. The key factor lies in students' thoughtful methodological development and pedagogical support in using digital tools following the principles of digital didactics. Only in such a case is it possible to achieve the expected learning outcomes regarding the development of digital literacy, critical thinking, and other relevant competencies [6].

The authors do not intend to provide a detailed description of all parameters selected for the comparison between traditional and digital didactics. This article provides only a brief overview of the pedagogical tools used in digital didactics, as shown in Table 1.

*Adaptive educational platforms* [3] enable the personalization of learning by providing each student with an individual academic plan. These platforms are digital systems that use algorithms to customize the learning process based on the student's individual needs and level of knowledge. They adapt the content, pace, and teaching methods to the psychological and physiological characteristics of the users as they interact with the platform [7].

Researchers addressing issues related to adaptive platforms note both positive and negative effects resulting from their widespread use in educational practice.

The positive impacts of adaptive educational platforms include the following:

− Effective personalization of learning. These platforms can adapt to each student's developmental stage and learning style, significantly increasing their engagement and motivation. Students receive information tailored to their current needs and abilities, facilitating understanding at their particular stage of learning [8];

− Increased learning efficiency. Adaptive systems respond immediately to students' actions, recognizing their knowledge gaps and offering additional material. This proactive approach prevents future errors and reinforces learning [9];

− Flexibility and accessibility. Adaptive platforms allow students to learn at any time and place, making education more convenient and adapting to individual schedules [9].

The adverse effects of adaptive educational platforms include the following:

− Skepticism among experienced educators. Some educators with extensive experience in traditional teaching methods distrust innovative teaching methods and tools. This skepticism can lead to resistance to change and insufficient support for new initiatives;

− Technological dependency. Like all network-based tools, educational platforms are highly dependent on the quality of devices and stable, fast internet connections. In some regions, limited access to technology and internet issues can limit the availability and effectiveness of these platforms;

− Lack of comprehensive research. There is a lack of large-scale studies that definitively demonstrate the effectiveness of adaptive learning compared to traditional methods. The existing scattered scientific papers investigating individual aspects of digital didactics sometimes lead to contradictory results and lack a systematic character [10].

The scientific challenges related to adaptive educational platforms as a key component of digital didactics can thus be addressed through the interplay of technological, pedagogical, and social factors. This requires a comprehensive approach for their scientific validation and implementation in educational practice.

*Simulators and virtual training platforms* enhance students' educational experience by enabling them to develop practical skills in a safe digital environment. These interactive systems simulate real-world conditions and processes for learning and practicing algorithms for academic or professional activities.

Key benefits of simulators and virtual training platforms:

− Safety in learning. Training takes place in a controlled environment, reducing the risks associated with real-life situations, which is particularly important for high-risk professions [11];

− Simulation of different scenarios. These tools can recreate virtual emergency situations and allow students to practice responses in conditions that are difficult to recreate in real life [12];

− Personalized learning. The approach can be tailored to the psychological and physiological profile of each learner, taking into account their level of knowledge, skills, and personal experience [13];

− Accessibility and flexibility. Learners can train anytime, anywhere, and have a range of options for specific activities [10];

− Monitoring progress. Learners' progress can be monitored to identify strengths and areas for improvement, focusing on feedback and customization of learning plans [14].

Challenges of simulators and virtual training platforms include the following:

− High development costs. High-quality simulators can be expensive to develop, which may limit their availability in various educational settings;

− Psychological factors. Not all students adapt equally well to virtual learning. Some may find it less effective than traditional methods or have difficulty with the new formats;

− Need for training. Effective implementation of such tools requires training for teachers on how to integrate these tools, which requires time and resources;

− Dependence on up-to-date equipment. Constant access to modern hardware and software is essential, which can sometimes be challenging.

To summarize, simulators and virtual training platforms are indeed powerful teaching tools. However, their implementation requires a thoughtful approach that considers various factors to maximize their benefits and minimize the drawbacks.

Let us examine *gamification* as another pedagogical tool within digital didactics. Gamification is considered a promising approach to education in the context of digital transformation in all areas of human activity. It involves integrating game elements and mechanics into non-game learning environments to increase student engagement and improve learning outcomes [15]. Gamification is becoming a key component of digital didactics.

The clear benefits of gamification as a teaching tool include [16]:

− Significant increase in student motivation and engagement through the use of game mechanics such as scoring, rewards, and competition;

− Better mastery of the material through the interactive and entertaining form of information transfer;

− Safe environment to practice practical skills through the use of simulations and augmented reality technologies;

− Adaptation of the learning process to the student's characteristics due to the flexibility of gamified systems.

However, in addition to the positive effects, there are also limitations and risks associated with the transition of the educational process to a gamified learning environment:

− Lack of a universal technological approach. The development of gamified systems often requires customized solutions for each educational task;

− Need for specialized training. As with simulators and virtual platforms, teachers require training to effectively design and implement gamified systems, which may require additional resources.

− Risk of overemphasizing gamification aspects at the expense of content quality;

− Dependence on modern equipment and software. The effectiveness of gamified learning often depends on advanced technology that is not always accessible, especially in educational institutions with limited financial resources.

Overall, gamification is a promising digital didactics tool that improves motivation and learning outcomes. However, its implementation requires a careful approach, considering the educational context's specificities and the available economic resources.

Another pedagogical tool within digital didactics is Massive Open Online Courses (MOOCs), which are popular and offer broad access to high-quality educational content. MOOCs are online academic programs accessible to a wide audience, allowing users to learn at their own pace. They offer a variety of content, including video lectures, tests, assignments, forums, and

communication tools, as well as additional resources to delve deeper into specific subject areas. MOOCs usually include reward systems and assessments to motivate students and test their knowledge [17].

The positive aspects of MOOCs as a pedagogical tool in digital didactics include the following:

− Accessibility. MOOCs make education accessible to people all over the world, regardless of their location, which helps to reduce global educational inequality;

− Flexibility. Learners are free to choose the time of learning and set their own pace of coursework, which is particularly useful for those who need to balance their education with other commitments;

− Variety of content. MOOCs offer a wide range of topics and courses, allowing learners to choose programs that suit their interests and needs;

− Quality of learning materials. Many MOOCs are developed by leading universities and experts in their field, ensuring a high level of academic content and relevance of information;

− Virtual learning communities. MOOCs often include organized online communities where students can share experiences, ask questions, and receive support from peers and course instructors, which deepens learning [18].

The negative effects of using MOOCs exclusively in educational practice include the following:

− Lack of face-to-face interaction. The lack of direct contact between students and teachers, as well as between students, can lead to feelings of isolation and lower motivation;

− Problems with access to technology. MOOCs require modern digital devices and a stable internet connection, which can be a problem for students in remote areas with limited resources;

− Low course completion rates. This may be due to a lack of motivation or lack of live support [19];

− Criticism of educational quality. Some researchers argue that MOOCs may not provide an adequate level of education and are not sufficient to promote critical thinking and a deep understanding of topics [18];

− Threat to traditional educational institutions. MOOCs offer alternative educational pathways that appear more attractive to students and may challenge the quality of education as a whole.

Thus, we see that MOOCs integrate videos, interactive elements, communication, and assessment into a unified system that effectively facilitates online learning on a large scale. Their flexibility and accessibility make them an indispensable tool in modern digital education. However, although they offer many advantages, online learning systems also come with various challenges and limitations.

In the current landscape of digital advancement, it is also important to consider educational tools that utilize artificial intelligence (AI) technologies [20]. The topic of AI is widely discussed today, with both educators and learners exploring the potential advantages and drawbacks of using the rapidly evolving technologies [21–24].

Without going into the positive and negative aspects of AI services, here is a brief analysis of their use in educational institutions. According to Yuri Chekhovich, Executive Director of the Russian plagiarism detection system "Antiplagiat," more than 3 million student papers were checked in the spring of 2024, of which about 600,000 showed signs of AI-generated content [25]. These figures vary widely between institutions, ranging from 2% to 58%. The use of AI-generated texts was particularly prevalent at universities in large cities.

No country has a formal legal framework for using AI at a national level. Most countries are still developing and focusing on public safety, data protection, and human rights issues. For example, some universities in China have banned students' use of AI [26].

Overall, the application of AI at Russian universities is in an active development phase, with many technological advances adapting to these emerging generative technologies. However, their use is often subject to the limitations set by the local regulations of individual educational institutions and the specific needs of different study programs and faculties.

Examples of advanced and proven digital didactics projects in Russia include the "Moscow Electronic School," a large-scale project to evaluate the didactic potential of digital platforms and tools in education [27]. Another notable initiative is the "Digital Assistants" program, which provides verified digital educational resources for students, parents, and teachers. This program focuses on structuring educational activities, creating personalized learning pathways, automating homework assessments, and using AI systems to design educational programs [28].

Various aspects of digital didactics are already being integrated into courses explicitly designed for teachers. These courses include "Digital Information Environment in Literature Education," "Modern Educational Technologies," and "Information and Communication Technologies in Inclusive Education" [2].

In addition to the national digital education projects mentioned above, other initiatives, such as the Digital Student Portfolio, are also being implemented in Russia. This tool enables students to develop digital skills, track achievements, and document learning outcomes [29].

In conclusion, Russia is actively implementing digital didactics in its educational practices, evidenced by the development of comprehensive digital education platforms and curricula. However, experts point out that the complete digital transformation of education requires further development of research work in digital didactics and an increase in teachers' digital skills [30].

The integration of digital didactics into the educational process offers significant benefits for both students and teachers.

For teachers, this transition will facilitate the development of personalized educational paths that respond to students' individual needs. This initiative will also broaden educators' pedagogical toolkit by integrating digital technologies, simulators, and gamification while advancing digital literacy to use contemporary teaching tools effectively [31].

Digital didactics is expected to improve the overall efficiency of the educational process through the integration of advanced information technologies, adaptive platforms, gaming elements, and other features [32]. This will help improve the quality of education through greater student engagement, personalized training, an enriched educational context, and the cultivation of essential competencies required for successful self-actualization in today's world.

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# ПЕДАГОГИКА

## ПЕДАГОГИЧЕСКИЕ ИНСТРУМЕНТЫ ЦИФРОВОЙ ДИДАКТИКИ

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**Аннотация.** Статья представляет собой теоретический экспресс анализ двух дидактик: классической и цифровой. Классическая дидактика, как область педагогики, исследует основные принципы и методы обучения, с акцентом на передачу учителем готового содержания и формирование у обучающихся необходимых умений и компетенций. В противоположность этому, цифровая дидактика, как новое научное направление, исследует организацию образовательного процесса в эпоху цифровой трансформации общества. Ее ключевая цель – проектирование процесса обучения с использованием современных информационных технологий, с акцентом на активную, самостоятельную познавательную деятельность обучающихся. Выделяются основные принципы, педагогические инструменты и образовательные результаты, которые отличают классическую дидактику от цифровой. Приоритет отдается экспресс-описанию педагогического инструментария цифровой дидактики. Приводятся верифицированные примеры реализации идей цифровой дидактики в российской системе образования. Делается вывод о том, что цифровая дидактика представляет собой комплексный подход к организации образовательного процесса, который включает в себя индивидуализацию обучения, расширение образовательного контекста, геймификацию, онлайн-обучение, использование искусственного интеллекта и обновление цифровой образовательной среды.

**Ключевые слова:** *адаптивные образовательные платформы, геймификация обучения, искусственный интеллект, ключевые слова, массовые открытые онлайн-курсы, педагогические инструменты цифровой дидактики, симуляторы и виртуальные тренажеры, цифровая дидактика, цифровая трансформация образования*

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