

THE DEVELOPMENT OF EDUCATION 5.0 AT THE AGE OF INNOVATION

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Summary

This article examines the development of Education 5.0 in the age of innovation as a new paradigm for the modernisation of education systems within the context of society's digital transformation. The relevance of the study stems from the need to train specialists capable of operating effectively in conditions of rapid technological change, uncertainty and global challenges, which requires a rethinking of the content, forms and methods of teaching. The paper analyses the theoretical and conceptual foundations of Education 5.0 and identifies its key characteristics, including human-centredness, the integration of innovative technologies, personalised learning and the development of 21st-century competences. Particular attention is paid to the role of innovation as a determining factor in the transformation of the educational process, specifically the use of artificial intelligence, digital platforms, data analytics and virtual learning environments. It is argued that Education 5.0 is aimed at fostering critical thinking, creativity, digital literacy and the capacity for lifelong learning. The study concludes that the effective development of Education 5.0 is possible provided that technological innovations are combined with humanistic values and equal access to educational resources is ensured.

Key words: innovation; digital transformation; personalised learning; competences; educational process; human-centred approach.

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1. Introduction

The current stage of societal development is characterised by rapid innovation, digital transformation and the challenges of globalisation, which have a significant impact on all areas of life, including the education system. In these circumstances, there is a growing need to rethink traditional approaches to organising the educational process and to develop a new educational paradigm focused on the harmonious integration of technological progress and humanistic values. The concept of Education 5.0 is precisely such an innovative approach, based on the ideas of personalised learning, the integration of digital technologies and the development of creative and critical thinking among learners. Education 5.0 is seen as a response to the challenges of today's innovative society, where artificial intelligence, big data, the Internet of Things, and virtual and augmented reality play a leading role (Rossokha V., Cheremisina S., 2023). At the same

time, it is not limited to the technological aspect alone, but involves the development of socially responsible, emotionally mature and creatively active individuals capable of self-development and adaptation in conditions of constant change. In this context, education acts not merely as a tool for the transfer of knowledge, but as an environment for the formation of a new culture of thinking and interaction. The implementation of Education 5.0 principles is becoming particularly relevant in higher education institutions, where future professionals for the innovation-driven economy are being trained. This involves the integration of digital platforms, the use of interactive teaching methods, the development of interdisciplinarity, and the cultivation of key competencies such as critical thinking, communication, collaboration and creativity. At the same time, it is important to strike a balance between the technologicalisation of the educational process and the preservation of the humanistic foundations of education.

A significant contribution to the development of the theoretical and methodological foundations of the competence-based approach was made by such Ukrainian scholars as O. Spirin, L. Kartashova, L. Cherednyk, V. Bykov, I. Smyrnova and others, who substantiated the role of digital technologies, the information and educational environment, and innovative pedagogical methods in the development of key and professional competences among learners. At the same time, the concept of 'Education 5.0' is receiving particular attention in contemporary research, reflecting a new stage in the development of educational systems within the context of the global digitalisation and intellectualisation of society. The theoretical and applied aspects of this concept are explored in the works of Yu. Romanyshyn, P. Saukha, L. Kononenko, I. Utyuzha, O. Luchaninova, N. Tkachenko and other scholars. Their research emphasises the need to combine technological innovations with the humanistic values of education, the development of learners' personal potential, and the cultivation of critical thinking, creativity and the capacity for lifelong learning.

To summarise the above points, the development of Education 5.0 in the age of innovation is a complex and multidimensional process requiring a systematic approach, scientific justification and practical implementation. Research into this issue allows us to identify effective directions for the modernisation of education, aimed at training competitive specialists capable of operating successfully in a digital and innovative environment.

2. Theoretical and conceptual foundations for the development of Education 5.0 in an innovative society

The theoretical and conceptual foundations for the development of Education 5.0 are shaped by the profound transformations taking place in today's innovative society, particularly in the context of the transition to a new development paradigm outlined by the concept of 'Industry 5.0'. In 2022, the European Commission published a policy paper entitled 'Industry 5.0: A Transformative Vision for Europe', which marked an important step in conceptualising a new model of industrial development. This document emphasises the need to move away from a technocratic model focused exclusively on efficiency and automation towards a human-centred paradigm, where sustainability, human well-being and the integration of innovative technologies in harmony with human needs are key.

These ideas directly influence the development of education systems, forming the basis for the emergence of the Education 5.0 concept. In this context, education is viewed not merely as a means of knowledge transfer, but as a complex socio-cultural system aimed at shaping individuals capable of functioning effectively in conditions of dynamic change, uncertainty and

technological saturation. In line with the «Industry 5.0» concept, there is a shift in emphasis from automation to augmentation, that is, the expansion of human capabilities through technology (Kononenko L., Savchenko V., 2024). This means that digital tools, artificial intelligence, the Internet of Things and other innovations should be used not to replace people in the educational process, but to enhance their cognitive, creative and professional potential.

An analysis of academic research leads to the conclusion that Education 5.0 is based on the integration of technological and humanistic approaches, combining innovative digital solutions with the values of person-centred learning. Within this concept, principles such as the individualisation of educational pathways, the development of critical thinking, creativity, emotional intelligence and the ability for interdisciplinary interaction take on particular significance. At the same time, it is important to foster a responsible attitude towards the use of technology, ethical awareness and social engagement among learners. Furthermore, Education 5.0 is geared towards ensuring sustainable development, which involves integrating environmental, economic and social aspects into the curriculum. This responds to contemporary global challenges and requires the training of specialists capable not only of applying technologies but also of assessing their impact on society and the environment.

3. The development of key competences among learners in the context of Education 5.0

The concept of ‘Education 5.0’, which emerged in the early 2010s, represents a logical continuation of the evolution of educational models, whilst integrating the most effective elements of previous approaches and transforming them in line with the challenges of an innovative society. Its key feature is a shift from the accumulation of knowledge to the development of human potential, particularly universal skills such as creativity, innovative thinking, the ability to solve complex problems, digital literacy and critical thinking. In the context of rapid socio-economic changes and the high uncertainty of the 21st century, it is precisely these competencies that determine an individual’s success and their ability to adapt.

The authors of the study note that the human-centred paradigm of Education 5.0 envisages the harmonious development of the individual, focused not only on professional training but also on fostering social responsibility, emotional maturity and a readiness for lifelong learning (Saukh P., Saukh I., 2023). Education is viewed as a continuous process that goes beyond formal learning and involves the learner’s active participation in their own educational journey.

One of the key features of this model is metacognition, which involves developing the ability to independently acquire new knowledge and master skills throughout one’s life. Another important feature is a focus on innovation and creativity, where the educational process is directed not merely at reproducing knowledge, but at generating new ideas, products and solutions. The development of so-called ‘soft’ skills plays a significant role – communication, collaboration, social and emotional intelligence, the ability to solve complex problems and the application of design thinking. Education 5.0 also involves personalised learning based on the interests, needs and abilities of learners. In this context, the role of the teacher is changing: they act not only as a source of knowledge, but also as a mentor, facilitator and advisor, guiding learners towards relevant resources and supporting them throughout the learning process. An important tool for implementing this model is the use of artificial intelligence, data analytics and distance learning platforms, which ensure the adaptability of the educational process.

Furthermore, Education 5.0 has a distinctly interdisciplinary nature, involving the integration of knowledge from various fields to foster a holistic view of the world and solve complex problems.

In the context of the development of Education 5.0 within an innovative society, particular importance is attached to the development of a set of key competencies that meet the requirements of the human-centred and technology-oriented paradigm characteristic of the 'Industry 5.0' concept. Education for the new generation focuses not only on the transfer of knowledge, but above all on developing the individual's ability to act effectively in conditions of uncertainty, rapid change and a highly technology-saturated environment. Among the leading competencies that determine the competitiveness of a modern specialist, critical thinking and creativity play a key role, ensuring the ability to analyse complex problem situations, make informed decisions and generate innovative ideas. Within the framework of Education 5.0, these qualities are regarded as fundamental to the development of an innovative mindset and the cultivation of an individual's creative potential. Social intelligence and emotional competence are also important components, ensuring effective teamwork, the capacity for empathy, communication, and the building of constructive interpersonal relationships. In the context of the digitalisation of education, these skills take on new significance, as interaction often takes place in a virtual environment.

Equally significant are digital literacy and technological competence, which involve not only mastery of modern digital tools but also an awareness of their impact on social processes, the economy and culture. Education 5.0 focuses on the use of technology as a means of empowering people, rather than replacing them. Furthermore, an important component is the capacity for continuous learning and self-development, which ensures an individual's ability to adapt to new circumstances and challenges. In today's innovative society, knowledge quickly becomes outdated, so the ability to learn throughout one's life is becoming a prerequisite for professional fulfilment. A final, but no less important, component is ethical and social responsibility, which involves an awareness of the consequences of using technology and a willingness to act in accordance with the principles of sustainable development. Thus, Education 5.0 forms a holistic system of competencies that combines technological training with the development of personal and social qualities necessary for effective activity in an innovative society.

4. Risks and potential shortcomings of «Education 5.0»

Although the contemporary educational paradigm of «Education 5.0» focuses on developing the human skills required for effective performance in an innovative society, it is, like previous stages in the evolution of education, not without certain limitations and challenges. In this regard, it is advisable to critically examine the potential drawbacks of this model with a view to taking them into account in educational practice (*George D., Georg A., Dr T. Baskar. 2024; Rossokha V., Cheremisina S. 2023*):

1. Excessive technologisation of the educational process. Although the use of digital technologies enables personalised learning and broadens access to educational resources, there is a risk of developing excessive dependence on them. This can lead to reduced concentration, information overload and so-called 'digital fatigue', which negatively impacts the quality of learning.

2. The widening of educational inequality. Hyper-personalisation of learning, focused on learners' individual interests, may lead to fragmented knowledge and insufficient development

of basic competencies: unequal access to technology and digital resources may exacerbate social and educational inequality.

3. The transformation of the teacher's role. The shift in the teacher's role from a knowledge provider to a learning facilitator may be accompanied by risks of a loss of professional identity and a decline in pedagogical fulfilment. In some cases, teachers may find themselves either in the role of passive observers or, conversely, as overburdened coordinators of the educational process.

4. The formalisation of innovation. Despite the focus on creativity and innovation, there is a risk of superficial innovations emerging that have no practical value or do not meet society's real needs. This may lead to a devaluation of educational outcomes as such.

5. A decline in the level of deep knowledge acquisition. A focus on rapid information processing and multitasking may reduce the level of deep understanding of the learning material. As a result, learners may demonstrate superficial knowledge without a developed systematic way of thinking.

6. Problems of ethical technology use. The widespread adoption of artificial intelligence and data analytics in the educational process raises issues of privacy, academic integrity and the responsible use of digital tools, which requires additional regulatory and methodological guidance.

5. Conclusions

The study found that the development of Education 5.0 in the age of innovation is a natural response by education systems to the challenges of digital transformation and global socio-economic changes. It has been demonstrated that a key characteristic of this model is the integration of innovative technologies into the educational process whilst maintaining the human-centred focus of education. Innovations serve not only as a tool for modernising the educational environment, but also as a determining factor in shaping a new quality of education focused on the development of creative potential, critical thinking and the ability to self-learn. Within the framework of Education 5.0, the use of technologies such as artificial intelligence, big data, virtual and augmented reality takes on particular significance, as they ensure the personalisation of learning, enhancing its effectiveness and adaptability to the individual needs of learners. At the same time, this innovative approach involves not only technological changes but also a transformation of teaching methods, the role of the teacher and the content of education, all aimed at preparing professionals to operate in conditions of uncertainty and rapid change. However, the effectiveness of implementing Education 5.0 depends on the ability to combine technological capabilities with humanistic values and ensure equal access to innovative resources.

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