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Implementation of innovative technologies in out-of-school education: opportunities and prospects

Aplicación de tecnologías innovadoras en la educación extraescolar: oportunidades y perspectivas

Olena Bykovska
https://orcid.org/0000-0001-6916-911X
WoS Researcher ID: CAI-1773-2022
Professor, Head of Department, Mykhailo Dragomanov State University of Ukraine, Kyiv, Ukraine.
Timur Bykovskyi
https://orcid.org/0000-0003-2822-4850
WoS Researcher ID: JDW-5543-2023
Associate Professor, Mykhailo Dragomanov State University of Ukraine, Kyiv, Ukraine.
Yaroslav Bykovskyi
https://orcid.org/0000-0002-8489-1247
WoS Researcher ID: GQC-8716-2022
Associate Professor, Mykhailo Dragomanov State University of Ukraine, Kyiv, Ukraine.
Nataliia Klivadenko
https://orcid.org/0009-0004-5656-8057
WoS Researcher ID: KLZ-1896-2024
Associate Professor of Department, Mykhailo Dragomanov State University of Ukraine, Kyiv, Ukraine.
Oleksandr Shevchenko
https://orcid.org/0000-0003-0881-0326
WoS Researcher ID: HRD-4072-2023
Associate Professor, Mykhailo Dragomanov State University of Ukraine, Kyiv, Ukraine.

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Abstract

In the context of globalisation trends and the overall digitalisation of the education system, out-of-school education is becoming an important tool in the development of learning environments. The purpose of this paper is to describe the main innovative tools in out-of-school education, based on the analysis of key challenges and opportunities. The study is based on a qualitative analysis of pedagogical literature and individual legal documents. Content analysis of literature and comparative analysis became important methods in this study. The data collection was formed only on the basis of modern literature in the range of 2012-2024. The obtained results highlighted various innovative solutions used in extracurricular education and described the basis of the possibility of their effective implementation. Special attention is paid to the difficulties of their implementation. Given the challenges and opportunities for the successful implementation of innovations, the main mechanisms for the effective implementation of innovative

technologies in out-of-school education institutions are developed. The conclusions note that the current challenges are the lack of material and technical resources for the active use of out-of-school education opportunities. In addition, the availability of appropriate professional training for teachers is also important. Thus, this study has demonstrated the importance of out-of-school education based on innovative technologies.

Keywords: difficulties, digitalisation, out-of-school education, edification innovative solutions, peculiarities of implementation.

Resumen

En el contexto de las tendencias de la globalización y la digitalización general del sistema educativo, la educación extraescolar se está convirtiendo en una herramienta importante en el desarrollo de entornos de aprendizaje. El objetivo de este documento es describir las principales herramientas innovadoras en la educación extraescolar, basándose en el análisis de los principales retos y oportunidades. El estudio se basa en un análisis cualitativo de la literatura pedagógica y de documentos jurídicos individuales. El análisis de contenido de la literatura y el análisis comparativo se convirtieron en métodos importantes en este estudio. La recopilación de datos se formó únicamente sobre la base de la literatura moderna en el rango de 2012-2024. Los resultados obtenidos destacaron varias soluciones innovadoras utilizadas en la educación extracurricular y describieron la base de la posibilidad de su aplicación efectiva. Se presta especial atención a las dificultades de su aplicación. Teniendo en cuenta los retos y las oportunidades para el éxito de la aplicación de las innovaciones, se desarrollan los principales mecanismos para la aplicación efectiva de las tecnologías innovadoras en los centros de educación extraescolar. Las conclusiones señalan que los retos actuales son la falta de recursos materiales y técnicos para el uso activo de las oportunidades de educación extraescolar. Además, también es importante la disponibilidad de una formación profesional adecuada para los profesores. Así pues, este estudio ha demostrado la importancia de la educación extraescolar basada en tecnologías innovadoras.

Palabras clave: dificultades, digitalización, educación extraescolar, soluciones innovadoras, peculiaridades de la aplicación.

Introduction

In modern conditions, pedagogical staff of out-of-school education institutions should not only have thorough knowledge, but also demonstrate such traits as flexibility, critical thinking, innovation, mobility, adaptability to new conditions, and constant readiness for innovative activities. Therefore, the modernisation of out-of-school education in line with modern integration processes is a relevant area today. Improving the system of out-of-school education requires the use of new technological solutions and innovative approaches that contribute to the professional development of out-of-school education staff. Thus, the learning process itself should be personalised, personally oriented and have a sound practical focus on innovation.

The term "learning out-of-school education" is a purposeful process and result of learning, nurture, development and socialization of the student's personality in free time in out-of-school education institutions and other social institutions (Bykovska, 2019).

The term "innovative educational technology" means a qualitatively new set of forms, methods and means of teaching and management that brings important changes to the outcome of the educational process and is a multicomponent model. Contemporary scholars have repeatedly emphasised the importance of innovative technologies in education (Vasilache, 2022; Borysova et al., 2024). Modern scientists have

determined the important role of innovative technologies in improving the motivation to study in students of education (Rahayu & Dong, 2023; Hansen et al., 2017). The researchers identified relevant innovative pedagogical approaches that have demonstrated their effectiveness in modern education, however, noted that not all approaches can effectively influence modern knowledge acquisition. (Feraco et al., 2022; Zhylin et al., 2023).

Thus, this problem is important for research: a thorough study of this topic will help to highlight the main effective technologies of knowledge transfer from teacher to student in the space of out-of-school education. Thus, the purpose of the study is to analyse the main innovative technologies in out-of-school education through the prism of researching opportunities and challenges in this area. Accordingly, the following tasks will be implemented: critical analysis of literary sources, characterisation of the main innovative solutions in the system of out-of-school education, study of opportunities and challenges for the introduction of innovative technologies in this area.

Literature Review

Bykovskyi (2019) analysed the training of future teachers for professional work in institutions of out-of-school education in the scientific and technical direction.

The study of the use of innovative technologies has intensified during the Covid-19 pandemic, and now, given all the current events and challenges, has begun to develop even more. In a conceptual study by Androshchuk, Androshchuk, Kurach, Khrenova, and Livshun (2020), the main principles of professional teacher training based on students' extracurricular activities are described. The researchers note that systemic, competence-based, synergistic, developmental, and personality-oriented approaches to the organisation of educational space should play an important role in out-of-school learning. Chisiu (2013) identified extracurricular activities as an alternative approach to implementing interdisciplinarity.

Bykovska (2019) revealed the theoretical and methodological foundations of out-of-school education in Ukraine. The historical and pedagogical essence of theory and practice of out-of-school education was explained; the basic chronological stages of out-of-school education forming and developing were showed. The analysis of modern state of out-of-school education in Ukraine in comparison with the out-of-school education in other European states was made. The scientific basements of out-of-school education system were proved, its structure and parts were determined. The model of modern system for organizing and administering the out-of-school education was characterized. The out-of-school contents and methodology were developed, being based on the competent approach (Baryakhtar & Bykovskyi, 2019).

Díaz-Iso, Eizaguirre and García-Olalla (2019) analysed the pedagogical conditions for the organisation of extracurricular education, and the authors also analysed in detail the theoretical and practical aspects of additional activities in higher education. Feraco, Resnati, Fregonese, Spoto and Meneghetti (2022) found that in extracurricular activities, the focus should be on the development of soft skills in students.

At the same time, the study by Onyshchenko, Serdiuk and Krykun (2021) describes the training of teachers for innovative activities in the field of out-of-school education. The authors determined that innovative forms, methods and technologies play an important role in this activity. It should be noted that modern researchers have studied various aspects of the use of innovative technologies in education (Vasilache, 2022). The key aspects of distance learning in Ukraine are described in detail in Galynska and Bilous (2022).

Besides, Makhynko (2023) identified the role of open learning resources as important innovative tools for organising learning. Rafael and Justino (2022) described the peculiarities of introducing virtual reality into the learning system, mainly analysing the practical aspects of using this technology to develop active learning. Also, according to Castilho Barilli (2012), virtual technologies play an important role as a didactic

tool in the organisation of modern e-learning. Malynovskyi, Duka, and Yaroshenko (2022) identified effective conditions for organising distance learning in Ukraine based on the introduction of various technologies and teaching methods.

Thus, modern researchers have identified various innovative technologies used in modern education. These works will be an important methodological basis for this paper, however, they did not pay attention to out-of-school education. Therefore, this study will try to fill in these gaps and focus on the specifics of introducing innovative technologies in out-of-school education.

Methodology

Considering the broad object of the study, namely a comprehensive analysis of innovative technologies in out-of-school education, the paper uses a qualitative analysis of modern pedagogical literature and individual educational documents.

Data collection

Data collection was carried out in stages. First, we found the main legal documents that ensure the functioning of out-of-school education in Ukraine. In particular, the Law of Ukraine "On Out-of-school Education" (Law of Ukraine 1841-III, 2000) defines the state policy in the field of out-of-school education, its legal, socio-economic, as well as organizational, educational and educational principles.

The Recommendations on the organisation of educational activities of out-of-school education institutions in the main areas in the academic year 2023/2024 (Ministry of Education and Sciences of Ukraine, 2023), Strategy for the development of out-of-school education (Bykovska, 2021) and the order of the Ministry of Education and Science of Ukraine "On the organisation of work of out-of-school education institutions" (2022) were important for the analysis (Ministry of Education and Sciences of Ukraine, 2022).

After selecting these documents, the stage of selecting scientific literature came. For this purpose, certain keywords related to the topic were used and entered into the Google Scholar search database.

Table 1.
Keywords for data collection

Key words	Similar phrases
Innovative technologies	Innovations VS innovative education technologies VS educational technologies VS digital technologies VS information and communication technologies VS digitalization VS innovative approaches VS technological solutions.
Out-of-school education	After-school education VS after-school program VS out-of-school time VS extracurricular education VS additional education VS extracurricular activity VS extracurricular education VS extracurricular activities VS extracurricular learning VS learning outside school hours.
Opportunities and challenges of using innovative technologies	Difficulties in the use of innovative technologies VS opportunities for the development of innovative education VS barriers to the use of technologies

Source: Authors' development

After entering the search database, we selected those sources that met the clearly defined criteria for including literature:

1. Preference is given to sources that are directly related to out-of-school education.
2. If the work does not relate to out-of-school education, it should clearly cover modern innovative educational technologies.
3. The work should be relevant and cover current trends in the development of education.
4. Date range: from 2012 to 2024.
5. Practical value: the sources should contain practical recommendations and advice used in out-of-school education.

Based on these criteria, we managed to select relevant studies that contain up-to-date information on the use of modern technologies in the educational system.

Data Analysis

This paper uses several research methods: thematic, comparative analysis and generalization. In particular, the thematic analysis allowed to identify the main technologies found in the selected sources. The comparative analysis allowed the authors to compare information from documentary sources with literature. The generalisation was used to summarize the information obtained and to draw the main conclusions to this study.

Results and Discussion

The introduction of innovative technologies in out-of-school education is an important trend that characterises the modern market of educational services. Important components that contribute to the introduction of innovation in the educational process include conceptual, content and technological components. They contribute to the creation of an innovative and investment-friendly educational environment through ongoing support of modern innovation initiatives. The innovative potential of an out-of-school institution consists of the interest of participants in innovative activities and the positive result of implementation, the digital competence of participants, the linking of the main goals of the institution with a new pedagogical idea, and the coherence of the interests of the subjects of innovative activity (Ministry of Education and Sciences of Ukraine, 2023). Innovative technologies contribute to the revolutionisation of out-of-school education, improve the teaching and learning process, and engage and interact with students beyond the traditional learning environment (Shevchenko et al., 2020).

In general, the process of introducing innovative technologies into the system of out-of-school education is important because students should be interested in additional classes that should be more interesting and therefore more innovative for them (Androshchuk et al., 2020). According to the analysis of modern scientific works, important innovative technologies used in out-of-school education are the use of online learning platforms, virtual (or augmented reality) technologies, mobile applications, gaming technologies (in some cases, simulation technologies). They contribute not only to the development of theoretical knowledge, but also to the development of practical skills of students (Castilho Barilli, 2012) (see Figure 1).

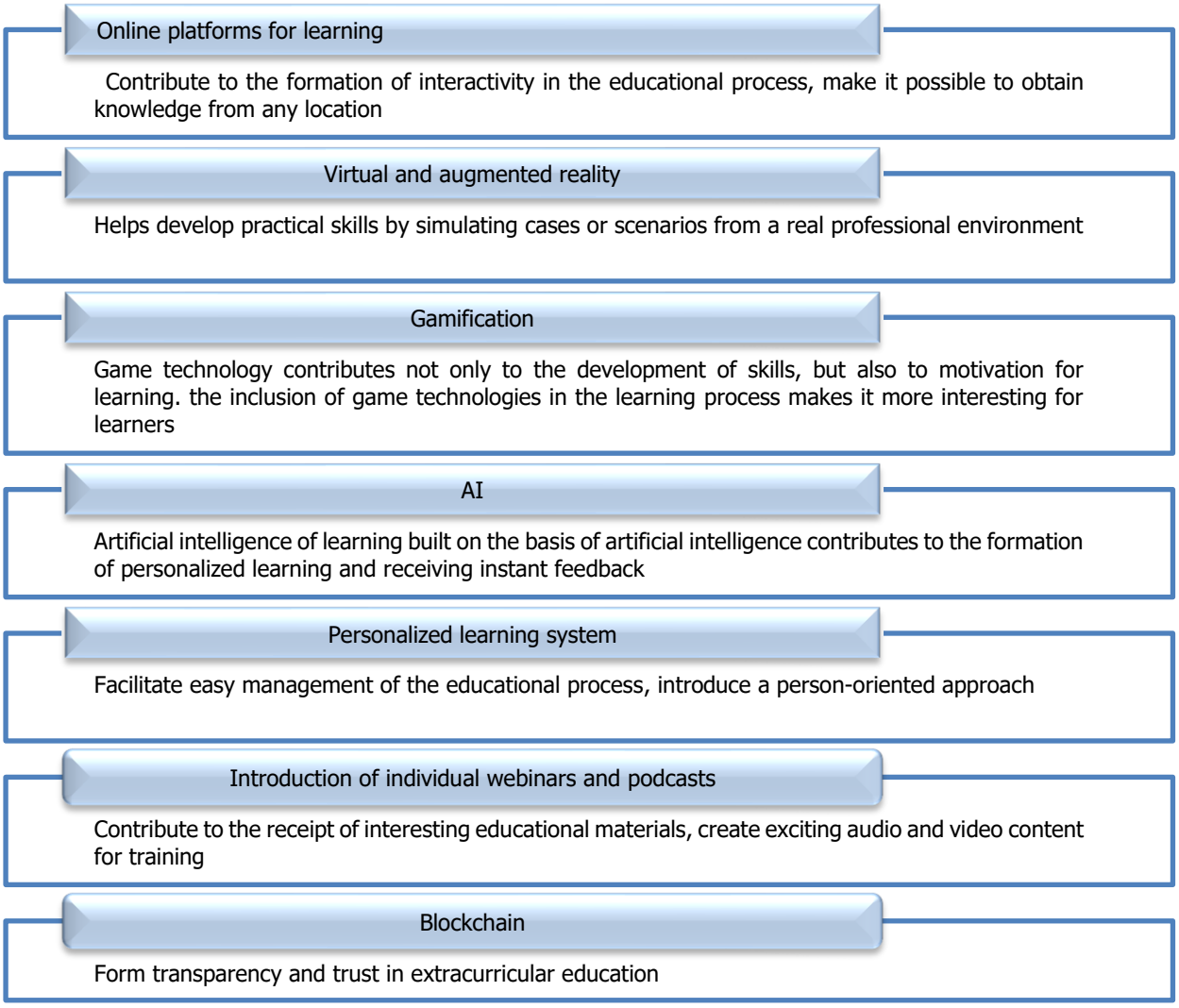

Figure 1. Key innovative technologies and their opportunities.
Source: Authors' development.

As can be seen from Figure 1, various innovative tools are used in out-of-school education. In particular, the use of online platforms and mobile applications in the out-of-school education system facilitates quick access to various learning resources. These platforms are characterised by their accessibility, flexibility, and facilitate self-learning opportunities. In particular, students can quickly find the necessary educational material or attend video classes from different locations (Meletiou-Mavrotheris et al., 2022). Virtual reality technologies also contribute to the development of practical skills of students, increase their interest in learning and allow them to actively interact with the digital learning environment (Rafael & Justino, 2022). In this sense, technologies based on artificial intelligence are also important (Sofilkanych et al., 2023).

However, in out-of-school education, they are used more for the purpose of organising and managing the learning environment. For these reasons, the use of blockchain technologies that support the security of out-of-school educational institutions is of great importance.

Game-based forms of learning are designed to keep students motivated to learn through various games. It has been proven that when a student wins a certain game activity, it not only contributes to their growth, but also increases their interest in acquiring further knowledge. Another important trend is the introduction of various electronic learning resources, including webinars and podcasts (Vasilache, 2022). On the one hand, they play an important role as supplementary learning materials, and on the other hand, they motivate students to search for educational information on their own.

Therefore, as can be seen from Figure 1, modern innovative technologies contribute to the formation of not only theoretical knowledge but also practical skills of students. They influence the transformation of out-of-school education, making it more innovative and attractive for students. However, the introduction of these innovative tools requires the appropriate digital competence of teachers (Tarteer et al., 2022). For this reason, professional development courses are important. Such individual learning initiatives are not spontaneous and do not contradict the traditional system of out-of-school education. In general, the quality of designing an individual learning trajectory for an out-of-school teacher is positively influenced by the humanisation of continuing education, which affects the choice of important values by out-of-school teachers, educational legislation that allows teachers to choose an individual learning trajectory and teaching methods, and the high level of professionalism of the organisers of in-service training for out-of-school teachers through the prism of the modern paradigm of person-centred learning (Evans & Achiam, 2021).

For this reason, the use of innovative technologies in the system of out-of-school education has both a number of opportunities and challenges. In particular, some difficulties may include additional costs for the institution to implement these technologies and the need for additional training of teachers, etc. Table 2 presents a summary analysis of the main challenges and opportunities for introducing innovative tools in the activities of out-of-school educational institutions.

Table 2.
Final comparative analysis of opportunities and challenges on the way to introducing innovative technologies in the system of out-of-school education

Online platforms for learning	
Challenges	Access to the Internet can be an important challenge (this has become especially noticeable in crisis situations). In addition, some regions may not have a high-quality fast connection, which limits students from gaining knowledge through these platforms. Another important challenge is the difficulty of maintaining motivation in online forms of classes.
Opportunities	Support flexibility in the schedule of extracurricular studies, contribute to the acquisition of knowledge from any location. Contribute to the distribution of various online educational materials. Thus, these platforms will contribute to the development of a person-oriented approach.
Virtual and augmented reality	
Challenges	Such technologies are very expensive for modern institutions of extracurricular education. Individual applications built on modern virtual reality technologies can also be expensive, and their free versions are not as effective.
Opportunities	Based on these technologies, students have the opportunity to learn in an exciting and interactive way. Such technologies contribute to the development of practical training and improve the motivation of students. On the basis of modeling and simulation of real situations, students' knowledge acquisition is improved.
Gamification	
Challenges	The formation of an effective gaming learning space can also be costly, in addition, it requires long and careful planning. Teachers need to clearly define the process of matching the game with educational goals.

Opportunities	The game improves not only practical skills, but also improves the psychological and emotional state of the students. Contributes to the formation of curiosity and motivation to study in students, develops a sense of achievement and a desire to learn more.
Artificial intelligence	
Challenges	Modern scientists have ethical concerns about the confidentiality of data entered into out-of-school educational systems. Likewise, AI-based technologies may not always be accurate.
Opportunities	Contribute to the automation of educational tasks, AI-based technologies are flexible, adaptive and contribute not only to innovation, but also to the interest of students.
Personalized learning system	
Challenges	There are concerns about the privacy of data entered into these personalized systems.
Opportunities	Make management of the educational institution easier. Contribute to the rapid receipt of educational information from the teacher to the student.
Introduction of individual webinars and podcasts	
Challenges	Quality issues with webinars and podcasts.
Opportunities	Exciting learning based on webinars and video podcasts of experts from various fields of knowledge.
Blockchain	
Challenges	Requires a high-tech infrastructure of an out-of-school education institution.
Opportunities	Increases the adaptability, safety and transparency of learning in an out-of-school education institution.

Source: Author's development based on analysis Castilho Barilli (2012); Galynska & Bilous (2022); Vasilache (2022)

Taking into account the various challenges and opportunities of introducing innovative technologies in an out-of-school educational institution, the management of an out-of-school educational institution should take the following measures for successful operation:

1. Formulating an understanding of the need for change and innovation in the teaching staff, as well as creating an appropriate information and technical space.
2. Implementation of systematic monitoring of the quality of educational processes in an out-of-school institution and publication of its quantitative and qualitative indicators (Rafael & Justino, 2022).
3. Updating the means of conducting innovation activities, identifying a number of problems, creating a creative innovation team to develop an idea and transform it into an appropriate programme.
4. Managing the development of innovations based on a continuous analysis of the state of functioning of the educational institution, determining the goals achieved.
5. Implementation of intra-school management of innovative pedagogical activities through the prism of teaching teachers innovative and experimental work within the framework of intra-school methodological training.
6. High-quality training of teachers for innovative teaching, development of new technologies (Androshchuk et al., 2020; Losheniuk et al., 2023).
7. Continuous improvement of the material and technical base of out-of-school educational institutions.

Thus, the availability of these conditions and the degree of readiness determine the complexity and scale of innovative reform of an out-of-school educational institution. Formation and provision of conditions for innovative development is the main and permanent function of an out-of-school institution. At the same time, in order to ensure the effectiveness of individual innovative technologies and the overall innovative pedagogical process, it is also necessary to take into account, analyse and monitor the results and consequences of innovations for the system of out-of-school education.

This study has demonstrated that there are various opportunities and challenges to introducing innovative technologies into the out-of-school education system. In general, modern scholars agree that the introduction of innovations can cause a number of difficulties and challenges (Tarteer et al., 2022). This research problem is also discussed work by Vasilache (2022), in which it was described the key challenges in the system of implementing of distance learning technologies. In addition, Meletiou-Mavrotheris, Eteokleous, and Stylianou-Georgiou (2022) agree that innovative technologies present both opportunities and challenges for the education system. The study identifies the importance of out-of-school education, which shapes the generation of the future, capable of understanding various innovative technologies. This statement echoes current research (Bolat & Köroğlu, 2020; Engeström & Käyhkö, 2021).

In particular, Berg, Achiam, Poulsen, Sanderhoff, and Tøttrup (2021) argue that it is difficult to develop relevant skills (including social skills and digital competences) in the formal education system within modern curricula. However, out-of-school education serves as an supplements to develop these important qualities that will be useful in the future. Also, according to current research, school curricula are increasingly suffering from overload as part of the accumulation of scientific knowledge and the introduction of various technologies and know-how (Berg et al., 2021; Firmansyah et al., 2020).

This situation presents an important challenge to making 21st century skills work. A solution that is often used to address this challenge is person-centred learning, which is difficult to implement in modern education. However, as proven in this research, it is in out-of-school education that this innovative approach is fully accepted and used by modern educators. This research problem was also of interest to other scientists, in particular, in the work of Hansen, Wallman, Teshome and Sporrong (2017), special aspects of the relationship between out-of-school education, motivation and achievement of students were considered. A similar research problem was also raised by the team of authors Hermanto, Udin and Sudirman (2023), who described the influence of certain teaching methods and extracurricular activities on the development of students' motivation to study. At the same time, a study by Mereniuk & Parshyn (2024) demonstrated that it is important to use modern integrated and innovative textbooks that promote interest among students.

Despite the fact that the study identified important challenges of introducing innovative technologies into the education system, it also identified the potential for the development of these institutions. This is in line with recent studies by Evans and Achiam (2021) and Munadi and Khuriyah (2023). These scientists characterized the innovative potential of scientific and educational extracurricular institutions and determined their role for the development of a sustainable modern society. The paper selects the main innovative technologies used in out-of-school education, with a special focus on virtual and augmented reality technologies, artificial intelligence, the introduction of innovative learning platforms, blockchain technologies, etc. Orhani (2023) noted that it is now difficult to imagine an education system without innovation.

Thus, the novelty of this study is a comprehensive analysis of the identification of the main innovative technologies used in out-of-school education, and the study of their main challenges and opportunities. It is also worth considering the presence of a subjective factor in the selected works for analysis.

Conclusions

Thus, the process of introducing innovative technologies in the system of out-of-school education has both opportunities and risks. In particular, important challenges include the adequacy of the material and technical base for the implementation of these innovations, the availability of relevant personnel with the appropriate level of professional training (digital competence) and motivation for self-improvement and lifelong learning.

However, the identified technologies have a number of advantages and opportunities for further use. In particular, in the context of vocational education, they contribute to the development of motivation and maintain students' interest in out-of-school education. In general, it is proved that out-of-school education is gradually becoming an important tool for learning and acquiring the necessary practical skills in the modern world of digital and non-digital learning environments. The work emphasizes the main mechanisms of effective implementation of innovations in the field of extracurricular education, it is determined that the important conditions are the constant improvement of teacher's skills and implementation of intra-school management of innovative pedagogical activities through the prism of teaching teachers innovative and experimental work etc.

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