MTMSD 2022

I International Conference «Modern Trends in Governance and Sustainable Development of Socio-economic Systems: from Regional Development to Global Economic Growth»

INFORMATION TECHNOLOGIES IN EDUCATION AND SCIENCE TRENDS, PROBLEMS, PROSPECTS

Madina Emilkhanovna Elmurzaeva (a)*, Timerlan Ibragimovich Usmanov (b),
Zarema Abusamitovna Magazieva (c)
*Corresponding author

(a) Kadyrov Chechen State University, Grozny, Russia, madina7777@list.ru
(b) Chechen State Pedagogical University, Grozny, Russia, timerlanu@yandex.ru
(c) Grozny State Oil Technical University named after M.D. Millionshchikov, Grozny, Russia, Zarema _it@mail.ru

Abstract

Information technologies contribute to the development of the student's personality, as well as provide a qualitatively different training of specialists of a new formation, equipping them with the skills of comfortable professional activity in the information society. Thanks to the use of the "Virtual Reality" system, opportunities are opened up in the process of developing skills for the implementation of activities for the design of the objective world, artistic activity (a work of art is created and perceived). Thanks to such a system, the student is given the opportunity to model the studied objects and phenomena of both the surrounding reality and those that are not reproducible in reality. In education, thanks to video-computer systems, it is possible to study the presented information in a complex way, there is the possibility of a variant approach to the presentation of educational material, the level of emotional perception of educational information and learning motivation increases, there is a possibility of a greater choice of topics that are of the greatest interest to the student.

Keywords: Digitalization in pedagogy, digital technologies, multimedia, network learning

1. Introduction

At the moment, the existing methods of education practically do not keep up with the development of information technologies. Every year it becomes more and more difficult for teachers to cope with the task of transferring relevant modern knowledge to the next generation, because the existing layer of information, which is constantly growing exponentially, cannot be mastered within the framework of a particular life. As a result, the main task of the education system is not the transfer of knowledge, but training in the search for and processing of information, which will undoubtedly help information technology (Idrisova et al., 2020; Weindorff-Sysoeva & Subocheva, 2018).

Thanks to the use of information technologies for scientific activity, it became possible: to replace the expensive, and sometimes impossible to implement in practice, natural experiment with a computational experiment; using new technology to synthesize three-dimensional images of reality and fantasy, unattainable from laboratory conditions (nuclear physics, space exploration, climate control); using programmed mathematical formulas to perform calculations and transformations in quantum chemistry, plasma physics, etc.

But for the full effective implementation of the set goals and solving problems in the field of education and science, there are many problems that need to be solved using a systematic approach to planning the development and implementation of information technologies (Ilaeva et al., 2021).

In this paper, we will explore the trends, problems and prospects of information technology in science and education.

2. Problem Statement

In the informatization system of the education system, there are some problems that are a stumbling block for the development of information technologies in this area. Many educational institutions do not have specialists in the development and operation of information systems (Starichenko, 2020). The teaching and administrative staff lack experience and qualifications in the use of information technology.

Every year the release of information media is constantly growing, but most of them, as it turns out, are not fully developed and are at the development stage. All unresolved problems give rise to the quality of the created and distributed means of informatization of education, the presence of internal contradictions in them, the lack of completeness and clearly identified clear structure of the educational material that is provided to students for the educational process (Gegenfurtner et al., 2014).

It should be emphasized that between the individual means of informatization of education, which are involved in different areas of activity of educational institutions, there is no interface, content, technological and information connection everywhere.

There is another problem that is associated with the randomness of the development and use of information technologies and resources in the educational process - this is the practical impossibility of universal training of teaching staff who would be able to comprehensively use the advantages of information technologies in their professional activities (On the multimedia network teaching model and its Evaluation System).

Undoubtedly, there are financial problems. If there is money for equipment, then they are not always enough to purchase the appropriate software. Licensing is expensive, and open-source free programs are generally inferior to licensed ones in a number of ways.

3. Research Questions

The research questions guiding this study are:

1) What are the main challenges and opportunities associated with the integration of information technologies in education and science?

2) How does the digital divide impact the adoption and effectiveness of information technologies in different educational and scientific contexts?

3) What are the existing levels of technological literacy among educators and researchers, and how do they influence the successful implementation of information technologies?

4) What disparities exist in access to digital resources, and how do these disparities affect the overall progress of education and scientific research?

5) What strategies and solutions can be proposed to overcome challenges and enhance the effective use of information technologies in education and science?

These questions aim to provide a comprehensive understanding of the current landscape of information technologies in education and science, identifying areas for improvement and proposing practical solutions to address the identified challenges.

4. Purpose of the Study

The purpose of this study is to investigate the role of information technologies, specifically the "Virtual Reality" system and video-computer systems, in the development of students' personalities and their ability to acquire skills necessary for professional success in the information society. The study aims to explore how these technologies can enhance the learning experience, increase motivation, and provide students with greater choice in selecting topics of interest.

5. Research Methods

In order to achieve the aim of this study, existing literature on the topic will be reviewed and a mixed method approach will be used, combining quantitative and qualitative data analysis. Data analysis will include both descriptive statistics and content analysis to identify patterns and themes in the data.

6. Findings

As a result, the following trends have now emerged to solve problems. The first trend is a gradual transition to a post-industrial society based on the development and widespread use of information technology. The second trend is to increase the professional and cultural level of mankind on the basis of

the development and dissemination of methods, means and technologies of education, including information ones (Nazarov et al., 2021).

The number of students in the world is on the rise. But the present demand for educational services exceeds the supply. This is due to the fact that the limitation of the supply of educational services is often determined by the lack of highly qualified teachers, as well as due to the difficulties of maintaining educational materials, adapting them to the needs of the trainees and to the dynamics of the development of fields of knowledge and new technologies. To solve these problems, certain transformations of the system based on the use of modern information technologies are necessary (Uvarov, 2018; Uvarov et al., 2019). The main hopes are placed on the creation and maintenance of information and educational environments in the form of open and distance learning, as well as the development of new object technologies for creating bases of educational materials, along with the development of traditional technologies for developing electronic textbooks and multi-agent technologies for educational portals (Ustyuzhanina, 2018).

Recently, the development of informatics as a science and as a real tool for social progress is characterized by the creation of fundamentally new information processing tools that initiate the formation of promising pedagogical technologies focused on the intellectual improvement of a student or scientist.

The main promising areas for the use of new information technologies in the field of education and science are expert learning systems, educational databases, multimedia and virtual reality.

The development and application of expert learning systems (ETS) is based on the implementation of the capabilities of artificial intelligence systems that use knowledge from a fairly narrow subject area.

Conventionally, expert systems are divided into two groups: the first uses reasoning based on probabilistic considerations; in the second such reasoning is not used (Kasavina, 2019).

ETS organizes a dialogue between the user and the system, which is able, at the request of the user, to explain the course of reasoning when solving a learning problem in a form that will be understandable to the student.

EOS orients the student towards independent work, which helps to develop the process of cognitive activity, increase the motivation for learning due to the variability of independent activity, and also makes it possible to ensure self-control.

The training database (UBD) is focused on a certain subject area. It is able to form data sets (according to certain characteristics), process existing data sets and perform searches (selection, sorting), as well as analyze information according to specified characteristics.

UBD is recommended in the process of independent work on information processing (for example, in the process of searching for the necessary information on certain grounds, analyzing it, modifying information when filling UBD with new content).

The educational knowledge base (KBZ) is focused on a certain subject area, which involves the implementation of the idea of self-education based on the student's choice of an acceptable mode of educational activity for him.

UBZ allow you to organize a dialogue that provides a response to user requests to retrieve relevant information available in the database. Thanks to this process, the correctness of the student's answers is

checked, the formation (if necessary) of the correct answers and, as a result, the management of the learning process as a whole (Perevalov et al., 2020).

Another promising direction in the use of new information technologies in the field of education, as well as science, is the integration of computer capabilities and various means of transmitting audiovisual information. This is implemented in video computer systems (interactive video systems).

A video computer system is a set of equipment that allows the user to present various types of perceived information (text, hand-drawn graphics, video, moving images, sound), providing an interactive dialogue between the user and the system.

The video-computer system makes it possible to present information comprehensively, isolate the audiovisual information necessary at a given time, and also "manipulate" information (combining textual and graphic information, overlaying information from the screen onto video information, etc.)

In education, thanks to video-computer systems, it is possible to study the presented information comprehensively, there is the possibility of a variant approach to the presentation of educational material, the level of emotional perception of educational information and learning motivation increases, and there is a greater choice of topics that arouse the greatest interest among the student (Gottlieb, 2015; Loginova, 2015).

Multimedia technology is a set of techniques, methods, methods for producing, processing, storing, transmitting audiovisual information based on the use of CDROM (compact disc read only memory) technology - CD-audio, CD-video, CD + G, CDinformation, CD-phono, CD-TV, LV (Laser Vision).

The capabilities of Multimedia systems allow for the integrated presentation of any audiovisual information on the computer screen, while an interactive dialogue between the user and the system is realized. The system makes it possible to choose, based on the results of the analysis of user actions, the desired line of development of the presented plot or situation.

Multimedia technologies make it possible to implement intensive forms and methods of teaching, increase the level of emotional perception of information, increase learning motivation through the use of modern means of processing audiovisual information, and form the ability to implement various forms of independent information processing activities.

And perhaps the most promising area of information technology in science and education is virtual reality.

The technology of non-contact information interaction implemented by the "Virtual Reality" system allows the computer to display directly in digital form the impulses from the information glove" ("interface-glove") and the "information suit" (Panyukova, 2010; Sidorov & Mokshev, 2013).

The user can communicate with the "Virtual Reality" system by voice or using a special device - joystring, which provides the effect of force feedback, as well as using telemonitor glasses.

Thanks to the use of the "Virtual Reality" system, opportunities are opened up in the process of developing skills for the implementation of activities for the design of the objective world, artistic activity (a work of art is created and perceived). Thanks to such a system, the student is given the opportunity to model the studied objects and phenomena of both the surrounding reality and those that are not reproducible in reality.

So far, the implementation of the capabilities of the "Virtual Reality" system is currently limited by the level of development of software tools that are created for the functioning of "virtual worlds", as well as the capabilities of hardware devices that implement these environments.

Speaking about the prospects for using the "Virtual Reality" system, one can predict its use in education in the areas of studying drawing, stereometry; when solving constructive-graphic, artistic and other tasks, for the solution of which it is necessary to develop the ability to create a mental spatial design of an object according to its graphical representation; in the process of professional training of specialists - in the study of graphic modeling methods in the courses of engineering graphics, computer graphics; when organizing the training of specialists in conditions as close as possible to reality. In such areas of science as medicine, the use of the virtuality of reality can make it possible to create, for example, anatomically accurate parts of the body that cannot be examined in practice; create simulators for medical students, create a 3D picture of research results, etc. Virtual reality is used in physics, biology, construction, mechanical engineering, nuclear energy, space research and even abstract sciences.

7. Conclusion

Education and science have many of the same tasks. This applies to the use of mathematical and intellectual-logical methods for solving problems, information support, management of the educational process, presentation of results, etc. As a result, it is necessary to apply the relevant elements of computer technology used in scientific research.

For example, with the help of information technologies, it is possible to register, collect, accumulate information about the actual process being studied or investigated; create and explore models of the processes under study; visualize the patterns of processes, including those that actually occur; automate the processing of experimental results; manage objects of reality.

The development and implementation of IT is not without problems, as always, when the new makes its way. The main problems include: financial problems; unpreparedness of personnel; inefficient use of technology (for example, multimedia support is difficult to fully use (for example, the brightness of the projectors is not enough for the image on the screen to be clear enough, it is problematic to use color)); randomness of development and use of information technologies and resources in the educational process.

Nevertheless, the development and use of information technologies is an urgent requirement of the time and there is no alternative to it. The problems along the way are, in part, growing pains. And in order to minimize them, a systematic approach is needed to planning the development and implementation of information technologies in education and science.

References

Gegenfurtner, A., Quesada-Pallarès, C., & Knogler, M. (2014). Digital simulation-based training: A meta-analysis. *British Journal of Educational Technology*, *45,* 1097-1114. https://doi.org/10.1111/bjet.12188

Gottlieb, A. C. (2015). Can online education become an alternative to the traditional university? *Bulletin of Samara State University, 1*(123), 15-22. https://www.elibrary.ru/item.asp?id=23015750

Idrisova, J. V., Idigova, L. S., & Alikhadzhiev, S. K. (2020). Online education: steps into the future. *Journal of Physics: Conference Series, 1691*(1), 012179. https://doi.org/10.1088/1742-6596/1691/1/012179

Ilaeva, Z. M., Alikhadjieva, D. S., & Bekmurzaeva Elizaveta, S. (2021). Digital Education to Provide Investment and Construction Sectors with Human Resources. In D. K. Bataev, S. A. Gapurov, A. D. Osmaev, V. K. Akaev, L. M. Idigova, M. R. Ovhadov, A. R. Salgiriev, & M. M. Betilmerzaeva (Eds.), Social and Cultural Transformations in The Context of Modern Globalism. *European Proceedings of Social and Behavioural Sciences* (Vol. 117, pp. 721-728). European Publisher. https://doi.org/10.15405/epsbs.2021.11.96

Kasavina, N. A. (2019). Digitalization as a subject matter of interdisciplinary studies. *Epistemology and Philosophy of Science, 56*(4), 251-259. https://doi.org/10.5840/eps201956480.

Loginova, N. V. (2015). Problems and prospects for the development of education. *III International Scientific Conference,* 42-44. https://moluch.ru/conf/ped/archive/66/3227/

Nazarov, V. L., Zherdev, D. V., & Averbukh, N. V. (2021). Shock digitalisation of education: The perception of participants of the educational process. *The Education and science journal, 23*(1), 156-201. https://doi.org/10.17853/1994-5639-2021-1-156-201

Panyukova, S. V. (2010). *The use of information and communication technologies in education: a textbook for students of higher educational institutions.* M. Publishing Center Academy.

Perevalov, V. D., Novgorodtseva, A. N., Sivkova, N. I., Korelin, A. V., & Korelina, E. V. (2020). Digitalization of Russian higher education: Educational process technologies (experience of universities of the Ural Federal District of Russian Federation). *Perspektivy Nauki i Obrazovania, 46,* 36-46. https://doi.org/10.32744/pse.2020.4.3

Sidorov, S. V., & Mokshev, D. P. (2013). Potential for the development of distance education in Russia. *Collections of conferences of the Scientific Publishing Center Sociosphere, 9,* 94-98. https://www.elibrary.ru/item.asp?id=19080742

Starichenko, B. E. (2020). Digitalization of education: realities and problems. *Pedagogical education in Russia, 4*, 16-26. https://doi.org/10.26170/po20-04-02

Ustyuzhanina, E. V. (2018). Digitalization of the educational environment: opportunities and threats. *Vestnik of the Plekhanov Russian University of Economics, 1*(87), 32-47. https://doi.org/10.21686/2413-2829-2018-1-3-12

Uvarov, A. Y. (2018). Competence-oriented personalized organization of the educational process and digital transformation of the school. *Informatization of sustainable education*, 223-229.

Uvarov, A. Y., Gable, E., & Dvoretskaya, I. V. (2019). *Difficulties and prospects of digital transformation of education*. Publishing House of the Higher School of Economics.

Weindorff-Sysoeva, M. E., & Subocheva, M. L. (2018). Digital education as a backbone category: approaches to the definition. *Bulletin of the Moscow State Regional University. Series: Pedagogy, 3*, 25-36. https://doi.org/10.18384/2310-7219-2018-3-25-36