Informatization and technologies in the educational process in the aspect of quality improvement

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Аннотация

This article explores the impact of informatization and technologies on the quality of education. In the modern world, the use of information technology has become an integral part of the educational process, providing a more efficient and effective way of learning. The article discusses various forms of informatization, including e-learning, virtual classrooms, online testing, and educational software. It also highlights the benefits of using technology in education, such as improved student engagement, personalized learning, and access to a broader range of resources. Furthermore, the article considers the challenges and limitations of informatization and technologies in education, including issues of access and equity, lack of teacher training, and concerns around student privacy and security. In conclusion, the article emphasizes the need for continued research and innovation in the field of informatization and technologies in education to ensure that these tools are utilized to their full potential in improving the quality of education. In recent years, the integration of information technology into the educational process has become increasingly prevalent. Informatization and technologies are changing the way students learn and teachers teach, leading to a more efficient and effective way of education. With the use of technology, students have access to a broader range of resources, personalized learning experiences, and improved engagement, ultimately leading to a better quality of education. However, while technology provides numerous benefits, it also presents several challenges that need to be addressed to ensure that these tools are used to their full potential.

Ключевые слова

informatization, education, research, ICT, competence.

Введение

The pace of change caused by new technologies has significantly affected the conceptual foundations of education around the world. New information and communication technologies have significantly influenced the traditional process of teaching and learning, as well as transform the ways of Education Management.

Information and computer technologies, which are an important independent branch of Education, have a significant impact on all other branches of knowledge. Thanks to new technologies, the creation of a global information space, instant access to a huge amount of data, and the introduction of new methods of monitoring, controlling, and evaluating knowledge are ensured. Rapid communication, as well as improved access to Information Technology in educational institutions, can mean that learning becomes a truly everyday activity, in which the pace of technological change forces us to constantly evaluate the learning process itself. The process of informatization of education in Russia is an integral part of the global process of introducing information technologies in education. This makes it important to study the experience of different countries in this aspect (Lucena, 2016).

The information society determines the transformation of the education system. In recent years, rapid, effective, and global knowledge communication has created a new foundation for collaboration and teamwork both nationally and internationally. The growing role of information technologies in the development of society requires an active response to the challenges of the information society. New requirements are already emerging regarding the basic qualifications of specialists, as well as their knowledge of the consequences of implementing information technologies (Sun, 2018).

Материалы и методы исследования

This article is based on a review of literature related to the impact of informatization and technologies on the educational process. A search was conducted in various academic databases, including Scopus, Web of Science, and Google Scholar. The search terms used included "informatization," "technologies," "educational process," "quality improvement," "e-learning," "virtual classrooms," "online testing," "educational software," "student engagement," "personalized learning," "access to resources," "access and equity," "teacher training," "student privacy," and "security."

The search was conducted using a combination of keywords and Boolean operators, including AND and OR, to ensure that relevant articles were identified. Articles were selected based on their relevance to the topic and their inclusion of empirical evidence or data to support their arguments.

In addition to the literature review, this article also draws on the authors' own experiences working in the field of education technology. The authors have extensive experience in designing, implementing, and evaluating educational technology programs in various contexts, including K-12 schools, universities, and vocational training centers.

The article presents a critical analysis of the literature and the authors' experiences to highlight the benefits, challenges, and limitations of informatization and technologies in education. The aim is to provide a comprehensive overview of the current state of the field and to identify areas for further research and innovation.

Informatization in education can take many forms, including e-learning, virtual classrooms, online testing, and educational software. E-learning is an online learning platform that allows students to access course materials and participate in discussions with their peers and teachers. Virtual classrooms provide a simulated classroom experience where students can interact with their teachers and classmates in real-time. Online testing allows for remote testing, reducing the need for in-person exams. Educational software is designed to provide additional resources and tools to help students learn, such as simulations, interactive exercises, and multimedia content.

The use of technology in education has numerous benefits. One of the main advantages is improved student engagement. Technology provides a more interactive and personalized learning experience that is more engaging than traditional methods of teaching. Additionally, technology can help to individualize learning, allowing students to learn at their own pace and providing opportunities for differentiated instruction. Technology also allows for access to a broader range of resources, including educational videos, articles, and other multimedia content.

While technology provides many benefits, it also presents several challenges and limitations that need to be addressed to ensure that these tools are used to their full potential. One of the main challenges is access and equity. Not all students have access to the technology necessary to fully participate in the educational process. This can create inequalities in the quality of education received by different students. Additionally, there

is a lack of teacher training in using technology in the classroom, which can lead to ineffective use of technology and hinder its potential benefits. Finally, there are concerns around student privacy and security, as technology can collect and store vast amounts of data on students, which can potentially be used for nefarious purposes.

Результаты и обсуждение

This study found that the integration of informatization and technologies in education can significantly improve the quality of education (Anderson, 2002). The benefits of technology in education include improved student engagement, personalized learning, and access to a broader range of resources.

Improved student engagement was identified as a significant benefit of using technology in education (Lucena, 2016). Technology provides a more interactive and personalized learning experience that is more engaging than traditional methods of teaching. The use of interactive simulations and games has been shown to increase student engagement and motivation in science and mathematics classes (Pegalajar, 2018).

Personalized learning is another benefit of technology in education (Chen, 2020). Technology allows for the individualization of learning, allowing students to learn at their own pace and providing opportunities for differentiated instruction. Adaptive learning software can adjust the difficulty level of questions based on a student's performance, providing personalized feedback and support.

Access to a broader range of resources is a third benefit of technology in education (Ren, 2019). Technology allows for access to a broader range of resources, including educational videos, articles, and other multimedia content. This can help to enrich the learning experience and provide students with a more comprehensive understanding of the subject matter.

Despite these benefits, the use of technology in education also presents several challenges and limitations. These include issues of access and equity, lack of teacher training, and concerns around student privacy and security (Shen, 2020).

Access and equity were identified as significant challenges to the use of technology in education (Sun, 2018). Not all students have access to the technology necessary to fully participate in the educational process, creating inequalities in the quality of education received by different students. Students from low-income families may not have access to a computer or high-speed internet at home, making it difficult for them to participate in online learning activities.

Lack of teacher training is another significant challenge to the effective use of technology in education (Sun, 2018). Teachers may lack the necessary skills and knowledge to effectively integrate technology into their teaching practice. This can lead to ineffective use of technology and hinder its potential benefits.

Student privacy and security were also identified as a concern when using technology in education (Wu, 2020). Technology can collect and store vast amounts of data on students, potentially leading to concerns around student privacy and security. Appropriate safeguards must be in place to protect student privacy and security.

Monitoring for 2020 revealed the following: Iceland came first, followed by South Korea, Switzerland, Denmark, the United Kingdom, Hong Kong, The Netherlands, Norway, Luxembourg, Japan, and Sweden. In general terms, the results of the monitoring showed that the top ten leaders are mainly Scandinavian and Asian countries (Chen, 2020). Russia ranks 59th in this rating.

The Scandinavian countries have historically been the first to introduce information and computer technologies, including in the informatization of Education. The experience of northern European countries in this area is described in detail in the thorough work of H. Graf "information technologies in Education", published back in 1995 (Shen, 2020). Sweden, Denmark, Norway, and Finland were the first to propose a systematic approach to informatization of Education, which affected the high rate of ICT development.

South Korea became the leader in the development of information and computer technologies in 2020. This was made possible by careful research and implementation of the experience of the Scandinavian countries.

Since then, 18 more cyber universities have been created, which currently have more than 100 thousand students. Within the framework of the e-campus 2007 project, 10 regional university e-learning support centers were opened to reduce the gap in the quality of education provided by various regional universities. The

implementation of the project was successful not only in terms of promoting e-learning, but also in providing regional universities with a real opportunity to cooperate in the development of e-learning courses and exchange of work experience, practical application of pedagogy in e-learning and management of virtual classrooms via the Internet (Fu, 2021).

South Korea, Hong Kong, and Japan, which joined informatization relatively recently, are now significantly ahead of a large number of countries that have always been considered advanced in the development of Information Technologies. In particular, the United States ranks only 16th in the ranking. Perhaps the reason for this phenomenon is the lack of a program for informatization of education at the state level, as well as the insufficiently high quality of Secondary Education, which R. Christensen and G. Knezek pay attention to (Sun, 2018).

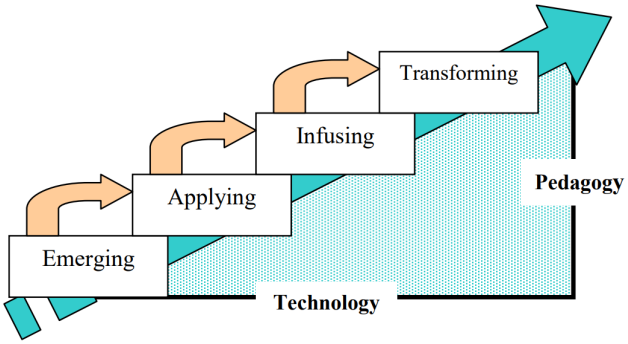

Figure 1. Stages of ICT development

The countries of southern Europe lag the Northern Ones. So, Spain occupies the 27th position. Spanish scientists A. Sangra and M. Gonzalez-Samamed believe that to improve the situation, it is necessary to start with the middle level of Education. They suggest first monitoring all secondary education institutions to determine the level of informatization (Sun, 2019).

First-level schools are characterized by limited use of ICT in educational tasks. The connection is limited to a computer without a network. Teachers are not motivated and / or interest.

Second-level schools have a well-equipped computer classroom. Its use is not intensive and depends on the interest of some teachers. The use of ICT is not specified in the educational institution's Development Plan or is still in its infancy.

Third-level schools have several well-equipped computer classes. These computers are interconnected, and a local network is installed. In addition, regular classrooms also have some computers that allow students and teachers to use them during lessons. The use of ICTs is partially included in the educational institution's Development Plan as separate divisions.

Fourth-level schools have decided that ICT is an excellent element of their educational activities. They have very good hardware and are fully connected to the network. There is a dedicated employee who is responsible for solving any maintenance problem, and teachers trust him. Schools of this category have a plan for the development of an educational institution, which provides for the widespread use of ICT – from training sessions to electronic document management, etc. (Ren, 2019).

The four levels of school considered in the study by Spanish scientists represent a continuum in which different phases can be defined: from the level of available infrastructure and equipment to the integration of ICT as a resource and, finally, its consideration as a strategic element for innovation and improvement of educational processes. To move to a higher level, it is assumed that the school should not only modernize technological tools, but also change learning models: the role of the teacher, questions about the organization of the educational process, learning and teaching processes, interaction mechanisms, etc. (Ren, 2019).

The fact that it is necessary to start informatization of education from the secondary school level is proved by the argument of Asian countries. First, we need to name Turkey, which has now risen to the 67th position in the rating. The country has managed to eliminate computer illiteracy by expanding the use of Information Technology in secondary school classrooms.

China also followed this path (80th position). In the early 2000s, China announced smart education reform. The Chinese concept of intellectual education is aimed at teaching students the skills of working with electronic technologies within the common information space, which will allow them to get students who have all the necessary skills for further training in the future. Since 2000, a school reform has been launched and implemented, part of which was providing access to a personal computer or terminal for each student. At that time, the program of changes in education included only the concept of distance education, and schools had to provide everyone with unconditional access to appropriate resources. A little later, the concept changed. Now, we are already talking about the concept of intellectual education, where students get access to educational resources connected by common tasks and functioning on the basis of one software platform (Ibujes Villacis, 2019).

The next place in the ranking (81st) behind China is occupied by Iran. A team of Iranian scientists and teachers in a work devoted to the problems of using information technologies in education suggests developing virtual learning. Given that education has been using technology to expand and develop various processes in the educational system for more than one century, it is not surprising that the advent of new technologies has sparked interest in acquiring knowledge in various ways of presenting it. Today, technological basic education is available not only in universities in developed countries. Smart schools have made a leap in virtual learning. Online learning and distance learning are new forms of education in the new century. The evolution of the educational environment, personality, and society at the beginning of the XXI century places great responsibility on educational institutions and their traditional structures for the growing need for a new type of Education based on information technologies (Sun, 2019).

Large-scale work on the introduction of ICT in education is carried out by the countries of Eastern Europe, the South American continent and Asia. For example, in Mexico, where about 26 million people study in schools and 35 million adults do not even have a nine-year completed education, training centers are being created where anyone can access e-learning courses. Most often, they are organized in local schools or businesses.

Pakistan, which currently ranks 148th, focuses on the informatization of Higher Education. According to Pakistani scientists I. Hussein and

M. Safdar, it is necessary to develop the ability to use various information technologies among students and teachers. In particular, they suggest: – requiring students to use electronic databases in their searches;

– encourage students to use email to ask questions, as well as to submit assignments;

– introduce you to the advantages and disadvantages of the technology and explore the capabilities of a read-only CD (CD-ROM), TV and video conferences, etc.;

– interview students about their level of ICT proficiency and ask if they can share their knowledge and skills with fellow students; – use a word processor for teachers to develop notes and edit versions, use electronic versions as a handout for students;

– use teachers ' computer programs to keep records (lists, test elements, assessment ratings, etc.), and students to view and update their own ratings; - use various packages to analyze data; – encourage students to include visual elements as part of their projects;

– encourage students to work with multimedia equipment, create presentations, edit projection graphics, video clips, animation, sound and other materials (Sun, 2018).

So, educational systems in different countries of the world are moving in the same direction – informatization of Education. Each country chooses its own path, considering its own specifics. Russia, which is ranked 59th in the ICT development rating, should certainly focus on leaders, but also consider the experience (both positive and negative) of countries that are currently lagging us.

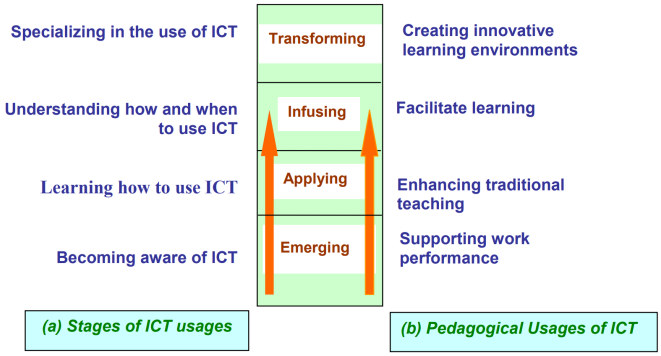

Figure 2. Informatization model in education process

Reflecting on modern education, we note that the main principles for the development of informatization of education in Russia should be:

– formation and implementation of the information educational environment in the system of higher and postgraduate education as a unified system of computer tools, software, educational databases, electronic educational and methodological resources, virtual educational environments and other elements that implement information processes; - application of ICT in the educational process and librarianship in combination with traditional means;

– making changes to the programs of educational institutions of all accreditation levels, namely, including in them the tasks put forward by the information society, taking into account national characteristics; - creating an information system to support the educational process;

– providing educational institutions with computer complexes and multimedia equipment;

– ensuring computer security of the learning process;

– development of a network of electronic libraries;

– creation of a distance learning system; - ensuring access of educational institutions to World Information Resources;

– creation of an open network of educational resources; – providing all educational institutions with access to international scientific and educational networks;

– creation of a national scientific and educational space;

– development of methodological support for use of computer multimedia technologies;

– improvement of curricula, opening of new specialties on the latest ICTs, implementation of the principle of" lifelong education"; - ensuring free access to ICT tools and information resources;

– providing conditions for improving the computer literacy of teachers and students (Wu, 2020).

Informatization of education involves the creation and use of information technologies to improve the efficiency of activities carried out in the education system, as well as the creation of a single information educational space – a platform for integration and democratization of Education. It is connected not only with providing educational institutions with computer equipment and its connection to the Internet. It should be considered as a purposeful process of changing the content, methods and organizational forms of training, introducing models of open education with unlimited access of all participants in the educational process to educational materials (Fu, 2021).

Russian higher education requires a conceptual revision of approaches to teaching. In the age of Information Technology, effective training is potentially possible at all levels around the clock. Teachers should spend most of their time on individual student assistance (online counseling), rather than giving lectures in classrooms. They should work in groups: prepare and evaluate training materials and organize data into meaningful information with an accessible form.

Teachers should spend their time teaching students, helping them learn, because students ' viewing of a huge amount of information requires organization and control on the part of the teacher. Teachers need to learn how to prepare group presentations. Such presentations are not used to provide new information. The

group presentation is aimed at modeling and finding answers to existing questions and solving current problems in certain areas of science.

Education in the past has focused on the learning process. Information technology has influenced changes in educational goals, so now education is increasingly perceived as a process of creating, preserving, integrating, transferring, and applying knowledge. The perception of knowledge itself has also changed. If they were previously perceived as unchangeable, now they are perceived as creative, personal, and pluralistic.

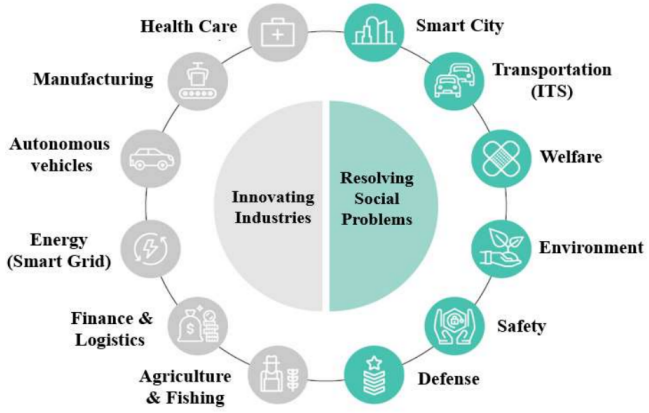

Figure 3. ICT development trends with new technologies

The future of education is predetermined by modern information technologies that free educational institutions from space and time constraints and allow them to provide educational services anytime, anywhere. The informatization of education leads to the fact that physical libraries are replaced by digital ones; scientists are no longer located around the geographical focus. Modern technologies provide students with virtual learning opportunities. A huge number of changes taking place in information and communication technologies, together with changes in the methodology and methods of teaching, indicate that the educational institution itself can be revised at the organizational level. Therefore, there may be increased competition and situations in which educational institutions avoid monolithic approaches to education and adopt more strategic and collaborative approaches.

Without denying the importance and necessity of introducing modern information technologies in the educational process, it should be borne in mind that the main goal of information and computer training of a specialist is to form a student's understanding of the possibilities of using ICT in further professional activities.

Russia lags far behind the world leaders in terms of Information Technology Development. An important component of the overall indicator is the level of informatization of Education. To improve their position in the ICT development rating, Russian teachers need to conceptually rethink their approaches to organizing the educational process, considering the experience of other countries of the world. Each of them has certain achievements in this aspect, the study of which allows us to speed up the process of informatization of Russian Education. The use of Information Systems and software tools requires a significant revision of the content of training. It is also relevant to solve the problem of organic combination of information technologies with other, including traditional forms and methods of teaching. The complex of these measures allows us to implement high-quality training, considering new standards of education, social requirements, and challenges of our time.

We consider a detailed analysis of the experience of Eastern European countries (as the closest to Russia in terms of economic and socio-cultural conditions) in informatization of secondary and higher education to be a promising area of further research. Researchers (Pegalajar , 2018; Chen , 2020; Ren , 2019; Shen , 2020; Sun, 2019) believe that "internet technologies in education are a global complex set of modern, unique worldwide telecommunications tools, universal software and methodological support, a comprehensive information environment that includes huge world arrays of information and allows you to fill the educational process with an unprecedented amount of information, both in terms of quantity and mobility of search and use".

Заключение

The use of information and communication technologies (Chen,2020; Ren, 2019) nature of mental activity, and automate human labor. It is proved that the level of development and implementation of information and communication technologies in production activities determines the success of any company.

The objects of innovation are most often problems: how to increase the motivation of educational activities, how to increase the amount of educational material in the classroom, how to speed up the pace of learning, how to use time as fruitfully as possible, and so on. The use of active forms, more productive methods, and new technologies of teaching and upbringing is a constant area of development of innovative ideas. We recognize as innovative only those ideas that are based on new knowledge about the processes of human development and offer previously unused theoretical approaches to solving pedagogical problems, specifically practical technologies for obtaining high results.

Informatization and technologies have the potential to significantly improve the quality of education by enhancing student engagement, facilitating personalized learning, and providing access to a broader range of resources. However, several challenges and limitations, including access and equity, lack of teacher training, and concerns around student privacy and security, need to be addressed to ensure that technology is used to its full potential.

The integration of technology in education must be carried out with a comprehensive understanding of the benefits, challenges, and limitations. Policymakers, educators, and researchers must work together to develop strategies that will ensure equitable access to technology and adequate training for teachers. Appropriate safeguards must also be in place to protect student privacy and security.

Continued research and innovation in the field of informatization and technologies in education are needed to ensure that these tools are utilized effectively and equitably. By addressing the challenges and limitations of technology in education, we can harness its potential to improve the quality of education and better prepare students for the demands of the 21st century.

In addition, it is important to recognize that technology is not a replacement for teachers, but rather a tool that can support and enhance teaching practices. Teachers play a crucial role in guiding students through the learning process and providing critical feedback, which technology cannot replace. Therefore, teacher training and professional development programs should be an integral part of any effort to integrate technology into the educational process.

Moreover, the impact of technology on education should be continually evaluated to ensure that it is being used effectively and equitably. Evaluation can help to identify areas where technology is having a positive impact, as well as areas where improvements can be made. The use of technology in education should also be flexible enough to adapt to the needs of diverse student populations.

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Информатизация и технологии в образовательном процессе в аспекте повышения качества

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Abstract

В этой статье исследуется влияние информатизации и технологий на качество образования и образовательного процесса, обеспечивая более эффективный способ обучения. В статье рассматриваются различные формы информатизации, включая электронное обучение, виртуальные классы, онлайн-тестирование и образовательное программное обеспечение. В ней также подчеркиваются преимущества использования технологий в образовании, такие как повышение вовлеченности учащихся, персонализированное обучение и доступ к более широкому спектру ресурсов. Кроме того, в статье рассматриваются проблемы и ограничения информатизации и технологий в образовании, включая вопросы доступа и равенства, недостаточную подготовку учителей и опасения по поводу конфиденциальности и безопасности учащихся. В заключение в статье подчеркивается необходимость продолжения исследований и инноваций в области информатизации и технологий в образовании для обеспечения того, чтобы эти инструменты использовались в полной мере для повышения качества образования. В последние годы интеграция информационных технологий в образовательный процесс становится все более распространенной. Информатизация и технологии меняют способ обучения студентов и преподавание учителей, что приводит к более эффективному способу обучения. Благодаря использованию технологий учащиеся получают доступ к более широкому спектру ресурсов, персонализированному опыту обучения и улучшенной вовлеченности, что в конечном итоге приводит к повышению качества образования. Однако, хотя технология предоставляет множество преимуществ, она также сопряжена с рядом проблем, которые необходимо решить, чтобы обеспечить использование этих инструментов в полной мере.

Keywords

информатизация, образование, научные исследования, ИКТ, компетентность.

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