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Pedagogical Education: History, Present Time, Perspectives

TO THE QUESTION OF THE USE OF DIGITAL TECHNOLOGIES IN EDUCATIONAL INSTITUTIONS

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Abstract

One of the priority areas for the development of education in the Russian Federation is the introduction of digital technologies at all levels of education, starting from the preschool age. Digitalization of society will be possible only if various educational systems of all levels are ready to switch to new educational information systems. Informatization of education has created the basis for a transition to a new level; digitalization is aimed at training specialists who are guaranteed to be in demand on the labor market, are fluent in mobile and Internet technologies, and are also focused on continuous learning (advanced training) through e-learning. The role of the teacher is fundamentally changing, and, in connection with this, the forms of his work with students are changing. The teacher no longer just presents information, he teaches digital technologies, teaches to navigate in the information space, including not only the skills of working with digital technologies, but also the ability to organize new communication through new computer. Speaking of the introduction of a model of digital educational environment, it is necessary to have an idea of if the education system is ready for this today.

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1. Introduction

Digital technology is now firmly embedded in our lives. Children start using gadgets from preschool age, while using not only entertaining and/or game content, but also learning something new for themselves, communicating, socializing, finding answers to many questions (Aiello, Fai, & Santagati, 2019; Juhaňák, Zounek, Záleská, Bárta, & Vlčková, 2019). It becomes obvious that the use of digital technologies in the education system can be not only a tool for development of cognitive activity of students, but also a serious resource that provides methodological and technical assistance to teachers (Agélii Genlott, Grönlund, & Viberg, 2019; Wong & Li, 2019).

In the modern educational situation, the elements of digital education are highlighted: a digital educational environment, a digital organization of the educational process, digital knowledge testing processes, digital technologies, educational organization, digital content, digital resources and digital interaction technologies (Ilomäki & Lakkala, 2018; Krasovskaja, & Isabekova, 2017).

2. Problem Statement

Digitalization and informatization of education is a rather complex modern trend related to the creation of an information educational environment through the introduction of various types of information tools and electronic products into the educational process, as well as new pedagogical technologies based on the use of ICT for teaching (Gorodeckaya, 2019; Vaindorf-Sisoeva & Subacheva, 2018).

3. Research Questions

The study addresses the following questions.

3.1. How developed is the issue of an integrated approach to the creation and functional filling of automated education management systems?

3.2. What digital technologies and resources at the federal and regional levels are available for teachers and are more in demand?

4. Purpose of the Study

The purpose of the study is to analyze the introduction of digital technologies in the general education system.

5. Research Methods

General scientific methods of theoretical research (analysis, analogy, synthesis, generalization, modeling), empirical research methods (comparative analysis, analysis and generalization of practical experience, content analysis).

6. Findings

At the federal and regional levels, digital technologies are widely used not only directly in the implementation of the educational process, but also in the process of organizational, technical and administrative support (Kuscheva & Terekhova, 2018; Petrova & Bondaryova, 2019). As shown by the analysis of the sites of the educational authorities of the constituent entities of the Russian Federation, in almost all regions, a system for automating of the education management has been introduced (<https://edu.gov.ru/national-project>). Thus, in St. Petersburg 72% of the total number of services of the Education Committee of St. Petersburg are automated, and it's 64% of the total number of powers. This made it possible to create a single information space, which includes executive bodies of state power and educational organizations (<https://petersburgedu.ru/>). The result of the system implementation was: optimization of time and labor costs for interagency requests (more than 1.5 million requests per year are now processed automatically); an increase in the number of daily unique users who visited the "Portal Petersburg Education" subsystem – an average of 145,000; reduction of time and labor costs for processing requests to confirm the fact of education of children – about 200 per day; equipping the educational organizations (EO) with information security tools; the introduction of services for possible non-cash payment for food and child's attendance of the educational organization record; optimization of time and labor costs for processing applications for enrollment in pre-school educational organizations (PEO) and schools (about 100,000 in EO, 130,000 in PEO). In addition, automation systems allow for various monitoring, slicing, and analysis of educational institutions in the shortest time possible and at the lowest cost.

From September 1, 2017, a cloud-based Internet platform, the Moscow Electronic School (MES), was introduced in all schools in the city of Moscow. This automated control system is a set of systems and processes that support the activity of the Moscow system of general education and includes a system of enrollment in schools, afterschool groups and sections of supplementary education, a system for controlling the access into the educational institution, a library of electronic educational materials, cloud-based accounting, and a pedagogical accounting system of personnel and contingent registry. This system also provides opportunities and tools for creating and editing educational and methodological materials, designing a digital basic educational program (<https://www.mos.ru/city/projects/mesh/>). The introduction of the system allowed to unite 55,000 teachers, more than 700 schools and 1.5 million users. Of greatest interest from the point of view of content is the "Organization of the educational process" resource, which is a methodological support service for teachers, including the possibility of using ready-made curricula, work programs in various subjects, scheduling and publishing information about the progress and results of the educational process on the Internet. The following services are also presented in the MES system: "Information Resources" is an aggregator of information resources, news feeds, catalogs of useful resources (links); "Distance Education" is a distance learning service for general, professional and supplementary education; "Electronic textbooks and study guides" is a library of electronic textbooks and teaching aids.

In the Republic of Tatarstan, the State Information System "Electronic Education of the Republic of Tatarstan" is currently operating, which is a single set of software products with an interface in Russian, designed to accomplish the task of uniting participants in the educational process into a single information space in order to create a single management and control mechanism, accounting and planning the activities

of educational institutions. The system provides software automation of the processes of creating profiles of educational institutions and users, admission and enrollment in educational institutions, certification of teachers (<https://edu.tatar.ru/logon>).

The automated information system of the Kemerovo region includes modules related to the personnel management of educational organizations, safety of public health activities of educational organizations, innovative and experimental activities. As part of the AIS, a unified educational information portal of the Kuzbass and a unified training management system of the Kemerovo region (<https://eschool.kuz-edu.ru/>) are also presented.

Information systems in the education of the Tomsk region include the following resources: SIS "Contingent-region", Electronic queue for kindergartens of the Tomsk region, AIS "Enrollment in EO", AIS "Education Monitoring", SIS "Regional Databases", School information systems of electronic diary and gradebook, AIS "Web City. Education", AIS "Textbook" (<https://sd.tom.ru/>).

The second block of using IT technologies relates directly to the implementation of the educational program.

In this section, it is worth highlighting the practice of applying IT technologies in the methodological support of the implementation of general educational programs, using IT technologies directly at classes and using them as auxiliary tools in preparing for lessons, monitoring knowledge, and obtaining additional materials and knowledge on a topic of interest.

At the federal level, the most ambitious project accumulating modern electronic resources is the Russian Electronic School (RES), which is a course of lessons (for grades 1–11) and has separate interfaces for a student, a teacher, and a parent (Russian Electronic School, n.d.).

RES has the following modules in its structure:

- for a student – video lessons, simulators and laboratories in various subjects, interactive tasks and exercises, popular-scientific videos, virtual museums, a bank of test assignments, including SFE (State Final Examination) tasks;
- for a teacher – a methodical bank with educational and programmatic, methodological and didactic materials in subjects;
- for a parent – an interactive school with materials for building an individual educational route for a child;
- for schools – a set of educational and methodological documents for organization of educational activities in all academic subjects from 1st to 11th grade.

All the considered examples of digital environments used in the regions and at the federal level represent SIS (state information systems), focused primarily on the integration of data between educational authorities, educational organizations and users (administration, teachers, students, parents). The main objective of these systems is to reduce the cost (time, personnel and other) for data processing, maintaining an automated system for accounting and assessing the quality of education, ensuring the availability of high-quality general education for everyone, including those living in rural areas, in remote areas and

municipalities. Working with content filling systems can be built both on the classical type, and with the use of blended learning technologies.

For the educational system at the federal level projects have been implemented to develop digital (electronic) educational resources (DER) for most subjects from grades 1st to 11th. The first, most used from 2006-2007 are the collections of DER developed as part of a project implemented by the National Training Foundation in conjunction with the International Bank for Reconstruction and Development and, subsequently, within the framework of the Federal Targeted Program for the Development of Education by the leading educational companies. The result of these projects was the creation of the Federal Repository of the Unified Collection of Digital Educational Resources, which includes DER for Textbooks; training programs and lesson planning; guidelines; educational materials and collections of DER in thematic areas (cultural and historical heritage, space, Russian museums, etc.), resource viewing programs; electronic punishments "Encyclopedia "Round-the-world ", "Quantum" magazine, "Science and Life" magazine, "Chemistry and Life" magazine.

To date, the site of the federal repository has more than 175,000 resources, the main part is auxiliary (additional) materials on subjects, directions, areas of knowledge; statistics on viewing/visiting sections, training materials. The authors conducted an analysis of the presented resources, which showed that the most popular are teaching materials in mathematics (more than 1,865,000 views), Russian language (more than 1,850,000) and physics (more than 600,000 views). At the same time, the new DER are not posted in this repository, the latest news on the website is dated 2015, the developed materials are dated 2007-2012.

The updated, up-to-date, informational and educational resource – www.fcior.edu.ru – is an open educational modular multimedia system (EMMS), combining three types of electronic educational modules: information, practical and control (<http://school-collection.edu.ru/>). The most popular are the DER from informational (average number of downloads is 5000-15500) and practical (average number of downloads is 8000-15000) modules.

For general education 10400 EER (elementary educational resources) are presented, while the number of the uploaded DER in different subjects and classes have a heterogeneous amount. So, for the subject of "Informatics and Information and Communication Technologies" for 9th grade, there is only one control module "Constructing Negation to Simple Statements Written in Russian. Control Tasks for Constructing Negatives to Simple Statements".

In the context adopted for 2010-2012 federal education development program, appropriate approaches were developed to create prototypes of new generation interactive multimedia electronic textbooks (IMET) for general education on the basis of modern mobile electronic devices, the requirements and criteria for meaningful scientific and psychological-pedagogical expertise, a substantive examination of more than 3000 EER and creative constructive environments was conducted, 12 prototypes of IMET and guidelines for publishers and developers of EER and IMET were developed, the introduction of electronic forms of textbooks in the general education system was tested (team of the Federal Institute for the Development of Education).

7. Conclusion

Based on the results of the analysis of national experience and illustrative examples of implementation of IT tools in educational institutions, the following conclusions can be drawn.

To date, all regions, schools with computer classes, interactive whiteboards, and other multimedia equipment have the opportunity to use IT tools in general education organizations. A huge number of electronic educational resources, interactive environments, collections of video, audio resources, aggregator platforms, automated information systems, etc., have been developed and are successfully used in the education system.

Electronic libraries, collections of the DER and EER are mostly free and open-ended. Educational and teaching materials are systematized for classes and subjects. In almost all federal and regional automated systems, such as RES, MES, AIS of the Republic of Tatarstan, Bashkortostan, etc., there is a possibility for open, free access to materials, the "electronic school" service. All this allows the participants of the educational process not only to diversify the methodology, technology and tools during training, but also to have the access to the lessons developed by the best teachers of the country.

A variety of forms and types of IT-tools enable the teacher not only to diversify their subject with additional informative materials, but also to apply new forms of work with students: blended learning, gamification, project activities, etc., which allows one to create, even with a low level of material and technical support, a motivating interactive educational environment. The undoubted pluses include the reduction of labor costs and time for preparing for the educational process, assessing the quality of knowledge gained, reducing the volume and time for completing various reporting documents, increasing the level of motivation and involvement of students not only in mastering the subject, but also in creating content and project activities.

At the same time, one cannot fail to note the disadvantages of the considered examples.

Often, the software used in a particular region is developed using sufficiently large funds, for narrow tasks, is not connected and not integrated with similar systems, which leads to multiple data duplication, to conflicts between systems, data distortion and inconsistency in different AIS. In most AIS, personal databases are not stored in Russian cloud systems. As a rule, content developed and published in AIS (electronic libraries, electronic schools, etc.) does not comply with uniform principles, requirements for electronic forms of textbooks, electronic educational resources, and does not undergo substantive, technical and design-ergonomic examination.

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