The Pedagogical Potential of Using Digital Tools in Teaching and Learning in Secondary Schools

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Abstract. The article considers the pedagogical potential of applying digital tools in teaching and learning in secondary schools. The active digitalization of all spheres of life in modern society raises the question of the appropriate transformation of information and communication spaces of education. The role of digital technologies, the introduction of which contributes not only to the modernization and development of education itself, but also creates prerequisites for improving the quality of training of future specialists and convergence of education with science. A prerequisite for the effective implementation of digital tools in the learning process is the appropriate digital competence of teachers themselves, that is, all teachers in educational institutions should be able to work in an information environment. First and foremost, digital technologies individualize the learning process and develop student autonomy. Digital technologies also help the teacher to optimally control the learning activities of students. The author concludes that digital technologies are no longer only a tool, but also a new environment for the modern school student, which can be used to solve a number of educational tasks, including improving the quality and attractiveness of information transfer, which in turn will help to maintain learning motivation.

1 Introduction

The relevance is determined by the special role of education in the life of modern society oriented to the principles and values of post-industrial era. The quality of human potential and people’s readiness to meet natural and social challenges largely depend on the efficiency of the education system. The active digitalization of all spheres of life in contemporary society raises the question of the appropriate transformation of the information and communication space of education before the education system. Digital technologies are becoming increasingly important, and their introduction does not only contribute to the modernization and development of education itself, but is also a necessary condition for improving the quality of training of future specialists and bringing education closer to science. Regulatory and legal acts are also actively orienting general education

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institutions towards the systematic incorporation of digital tools into the educational process.

The Federal state educational standard of general education prescribes the creation of an information and education environment as a requirement for the conditions of programme implementation; this should provide, inter alia, the possibility of using available teaching and training resources in electronic form, electronic educational and information resources, tools for assessing knowledge and competencies, and other facilities required to organize educational activities using e-Learning [1].

Thus, the normative and legal provision of digital education regulates certain changes in its organizational and methodological aspects and constitutes the basis for its further development.

2 Research Methodology

In addition to economic factors, the need to digitize education is also dictated by the social challenge of recent years - the ongoing Covid-19 pandemic. Despite the fact that in Russia the programme of digitalization of education began to actively develop in 2016 (long before the pandemic), the global coronavirus lockdown became a kind of catalyst in this process, when the use of digital tools in education has become a vital necessity. At the same time, the pandemic exposed a number of problems, among them psychological and methodological unpreparedness of teachers for the digital model of education, expressed, among others, in the lack of sufficient quantity and quality of digital content in many school subjects.

However, the current trend in school practice is that the creation of digital educational resources is mainly done by teachers, and their activities result in fragmented educational products on individual topics of educational material. At the same time, they do not always meet didactic and technical requirements for digital educational tools. In addition, the analysis of literary sources shows that the methodological system of designing digital educational resources for the history of Russia for older students has not yet been the subject of special research. In this regard, the study of the development and application of digital tools in history education for this category of students seems to be a very relevant area of research.

Most educators note that at present there is a tendency to reduce the effectiveness of traditional teaching methods [2].

This problem is especially typical for high school students. In addition to psychological reasons, this phenomenon is caused by a number of pedagogical circumstances. At this age, meaning-forming motives begin to form, which is expressed in a dual attitude towards learning activities.

3 Results and Discussions

The new generation of learners is the so-called Generation Z, living in a digital environment shaped by many technologies, including big data, distributed registry systems, artificial intelligence, robotics components, wireless communication technologies, virtual and augmented reality technologies, and cloud technologies. Even at a young age, members of the digital generation are acquiring the basics of gadgetry faster than adults. Real-time games are being replaced by online games, and interpersonal communication is being shaped and supported by social networks or messengers. The modern possibilities of searching for information, reading, typing have a different effect on the human body
compared to the use of a printed book, slate or notebook. In this case, other neurons and cortical areas are activated [3].

The ability of today’s students to access several sources of information simultaneously causes changes in their perception of objective reality, which negatively affects their attention span, which has a negative impact on their learning activities. This raises the question of whether the rapid digitalisation of students’ lives can be dealt with effectively, and what new approaches are available to address the problem.

Some teachers believe that in the presence of distractions, such as cellular phones, students’ attention becomes distracted and concentration on the learning material becomes difficult. Consequently, traditional methods prevail in the learning process and the educational potential of digital technologies is ignored.

In our view, given that today’s high school students are of the “digital” generation, we should not fight against digital tools, but promote their use in the right direction. Digital technology has many advantages, but the most important one is that it generates sustained interest in students, which can be used to attract their attention and actively engage them in learning activities. Thus, digital tools can be a real solution to the problem of keeping learners motivated in upper-secondary schools.

The need for active digitalization of education is not only a widely broadcast opinion of the pedagogical community in Russia, it is now enshrined in a number of legislative norms as a priority direction of state educational policy. Thus, according to the national project “Digital School” and the federal project “Digital Educational Environment”, it is planned to create a modern and secure digital educational environment by 2024.

The main directions and expected results of the digitalization of Russian education are reflected in the Federal Educational Standard for Basic General Education (FSES OOO). This normative document defines the organizational and methodological aspects of conducting educational classes. In addition, it establishes requirements for the results of students’ acquisition of educational programmes, which are closely connected with the digitalization of education. For example, the FSES among others mentions such multidisciplinary skills of working with information [4].

Thus, the introduction of digital tools becomes a legally enshrined direction of education modernization, which should improve the quality of future specialists’ training and bring education closer to science.

The term “digital tools” is rather rarely used in pedagogical literature. For example, researcher L.M. Shaikhutdinova understands a digital educational tool as a digital resource used by students and teachers as a tool (tool) of activity [5].

The term “digital educational resource” used in this definition is more common in the works devoted to the digitalization of education and has a large number of interpretations.

Russian educator M.V. Kondrashkin defines a digital educational resource as “an information resource stored and transmitted in digital form” [6].

In our opinion, this interpretation more fully reveals the belonging of this concept to pedagogical topics, as the author indicates the scope of its application.

Similarly to M.V. Kondrashkin’s interpretation, this definition is dominated by the form of presentation rather than the purpose of information. Analyzing the above formulation of the concept “digital tool” and related terms, it can be noted that all of them in one way or another define their main essential characteristic – the organization of interaction between all participants in the educational process with the active use of digital technology in the transfer of knowledge from teacher to students. We will use the definition proposed by L.M. Shaikhutdinova as a working definition for this study. In our opinion, the author’s definition above takes into account not only the technical features of digital tools but also their applicability to all participants in the educational process.
In addition, the above terms are actively used to describe other concepts describing the process of digitalization of education. For instance, many studies as well as a number of normative documents refer to the digital learning environment.

The same notion is used in the FSES, as well as in a number of federal and national projects.

The efficiency of using digital tools to solve a whole range of pedagogical tasks (including the improvement of the quality and attractiveness of information transfer) depends on the observance of a number of didactic principles. It should be noted that the specifics of the latest educational tools, to which digital tools can be rightly referred, give rise to new key principles of organizing the educational process. Among them are the following:

- The principle of personalization, which implies the planning of a variant part of the content of students’ educational work, ways of presenting the material, a different pace of performing tasks, taking into account their individual characteristics and personal preferences. This principle forms the basis for the selection and construction of an individual educational route for each student;

- the principle of flexibility and adaptability, which is closely linked to the principle of personalisation. It implies individualization in the learning process in the organization of the order, methods and pace of presentation of educational material, definition of the features of pedagogical support, expressed in the form of individual recommendations, number of repetitions, level of complexity of tasks, etc;

- the principle of dominance of the learning process, which implies a shift of emphasis from the teacher and the peculiarities of presenting the material to the learner and the information he or she is learning. Adherence to this principle is associated with a change in the role of the learner and the teacher in the process of knowledge transfer and acquisition. Thus, modern changes in teaching presuppose the implementation of the system-activity approach, in which the independent learning activity of the learner is fundamental, and the role of the teacher is to organize conditions for the manifestation of the learner’s learning activity, motivation for self-education and self-development;

- The principle of co-operative and cooperative education implies that the teacher is responsible for organizing the conditions for a learner’s learning activity, motivating him/her for self-education and self-development; and

- collaborative, cooperative learning involves the use of digital tools to encourage active, multiple communication between teachers and learners.

- In addition to the above-mentioned principles, a prerequisite for the successful implementation of digital tools in the classroom is the digital competence of the teachers themselves, all teachers in an educational institution should be able to work in a digital environment.

In order to use digital tools successfully in the educational process, a teacher must

- Be competent in the use of digital tools as a pedagogical tool;

- be able to use digital tools methodologically in a successful and efficient pedagogical process;

- be competent in the use of digital learning tools in teaching and learning activities to achieve good results.

At present, the implementation of pedagogical innovations in the educational process is relevant. The use of modern digital technologies, in particular, refers to effective learning tools.

The question arises as to how students can be motivated and what effective ways, methods and means should be used to present historical material in order to ensure a high level of performance in their perception and comprehension of the necessary information. One effective solution is to use video information to ensure that students understand the
content correctly. Textual information in textbooks is often complemented by black and white or colour illustrations that demonstrate particular phenomena and processes. However, it is technically impossible to illustrate all of the curriculum material within a textbook. Single static pictures provide only a limited image of a historical event or personage and can often cause misunderstanding among pupils.

The rather high requirements for the learning outcomes of the curriculum outlined in the educational standard cannot be met by one or two simple illustrations, whereas videos are capable of forming the ideas of high school students to the necessary extent.

Since digital technologies are rapidly updating and developing, improving digital competence of teachers should become a systematic and systematically organized work, the main directions of which are self-education, as well as exchange of experience and effective ways of work. Observance of these conditions will allow effective use of a large number of advantages of digital tools, which make them stand out among the modern means of education. First of all, digital technologies individualize the learning process and develop student autonomy. The quality of education improves as lessons start to respond to students’ personal interests and needs. Digital technologies also help the teacher to have a better control over the learning process of the students.

This circumstance allows us to consider digital tools as the most effective means of implementing one of the key principles of didactics - the principle of visibility, because it directly affects the emotional component of information perception and the effectiveness of cognitive activity. In this regard, this principle in the process of teaching with the use of digital technology remains relevant today. The use of devices and gadgets which are familiar to students allows teaching and learning information to be conveyed in a familiar and preferred form.

This fact has made digital tools one of the most advanced educational technologies in the context of the ongoing pandemic of Covid-19.

At the same time, it should be noted that the initial forced transition to digital learning, even after severe restrictions were lifted, made a return to the “pre-Sovid era” education system quite obviously impossible. According to N.A. Kramarenko, Doctor of Psychology, “the educational situation of 2020 will be analyzed and studied as one of the revolutionary periods in the history of pedagogy, which has had a cardinal influence on the further development of the 21st century education system and has determined the choice of its key vector”[7].

The use of digital tools makes the learning process more practice-oriented, which implies the acquisition of knowledge not in a ready-made form from a teacher-translator, but in the course of independent cognitive activity. Experience shows that the teacher’s use of digital resources in the educational process makes it possible to organize effective independent work of students, taking into account their individual educational needs, such as learning material in the course of work with Internet resources. Examples are the organization and carrying out of virtual laboratories and practical works, creation of educational online projects, conducting educational video games, etc. [8].

In addition to the direct subject tasks within the framework of lessons for specific subjects, this approach to the organization of the learning process allows the formation of students universal competences, such as digital literacy, the ability to work with different sources of information, networking skills, which are necessary in the modern world for any person.

Another difference of digital learning technologies is their rapid development, which causes the constant emergence of new digital tools.

Examples of specialised digital tools created for the preparation of authoring educational resources are e-learning systems which make it possible to remotely present educational material and check assignments, share material with other group members and
leave comments on students’ work. The Google Classroom and Moodle platforms remain topical today. This group also includes services for creating quizzes, tests and polls, discussions and tasks to provide instant feedback to learners during lessons. Such digital tools include Kahoot, LearningApps.org, Quizizz, Plickers, etc. The second group includes tools that retain a sufficiently high potential for their use in the learning process.

Let us consider the digital tools that have become most widespread in teaching and learning in high school. First of all, these are numerous educational platforms, portals and websites containing a wide range of interactive online services. Their high level of importance lies in the fact that they provide teachers, learners and parents with information, tools and resources to provide the necessary assistance in improving the quality of education.

Prepared courses or fragments of courses to be used during the lesson or in students’ independent extra-curricular activities are the building blocks of the learning content on the platform. Communication, including messaging, discussion forums, noticeboards and blogging among participants in the learning process, is done through email. Learning management is provided by systems that track and record student learning progress. The most common way to track these changes is through assessment tests.

The popular online platform Uchi.ru provides educational services to students from all regions of Russia. Pupils are offered interactive tasks, which correspond to the curriculum for all academic subjects. Each student gets an opportunity to study a course at a comfortable pace with the necessary number of repetitions and revisions, regardless of the level of training, social and geographical conditions. The Uchi.ru platform takes into account the speed and accuracy of the assignments, the number of mistakes and the student’s behaviour. Thus, the system automatically selects personalised tasks, sequences and levels of difficulty for each student. The platform reacts to pupils’ behaviour in different ways: for correct answers pupils are praised and given a new task; for incorrect answers pupils are asked clarifying questions to guide them to the correct answer. The most common way to track these changes is through an assessment test [9].

One platform that effectively solves the problems associated with storing learning material, organizing students’ independent work and conducting all forms of control is the web application “Moodle”. The “Classwork” service from LECTA simplifies teacher preparation for lessons, as by adding the programme to their portfolio, they can get free access to presentations, plans, lesson outlines and multimedia applications. This digital tool is well adapted for use on computers, tablets or interactive whiteboards. The use of the systems to create different online forms to monitor students’ knowledge is very relevant.

At the same time, it should be noted that among the large number of educational games there are practically no quality educational products applicable to work with high school students. Some game elements are presented in the Learningsapps service discussed above, but at present educational video games remain the privilege of younger students, because the technical requirements for this type of educational tools used for this age are low. Creating a full-fledged video game product for older students is expensive both financially and technically, and not yet in the interest of game developers [10].

One of the most relevant digital learning tools are video lessons (videotape, video fragments) and audio recordings. Given the physiological characteristics of pupils’ memory, all types of memory should be activated in lessons. For many pupils, activation of visual memory with video recording allows them to learn information much better. However, it is inadvisable to organise a training session using only video or audio recordings, as this contradicts health-saving technologies and does not correspond to the peculiarities of human perception of new information in this way.
Concluding the consideration of digital tools which can be applied in high school, it is necessary to focus on technologies which, in a sense, represent the future of digital Russian education.

Augmented reality in education is also a new trend. This technology is already quite widely used to create teaching aids, but it has not yet been introduced into teachers’ everyday pedagogical practice, since it requires rather deep specialist knowledge.

The use of digital tools in educational activities represents a special way, which requires their organic integration in the organization of classes. Hence, it becomes important to have a methodology, reflecting a set of concise and well-defined practice-oriented suggestions and guidelines to facilitate successful implementation of digital tools in the educational setting.

Effective use of digital resources to enhance the quality and attractiveness of the information conveyed will be facilitated by the professional competence of the teacher. Qualification level, methodological expertise will ensure a higher degree of mastery of the patient outcomes.

The use of digital learning resources in the process of studying the material implies the following advantages:

1) there is an increase of positive motivation of learning, activation of cognitive activity of students;
2) lessons are characterized by high aesthetic and emotional levels;
3) training session is provided with visualization;
4) volume of work at a lesson increases by 1.5-2 times;
5) individualisation of learning is ensured;
6) possibilities for independent activity of pupils are extended of students; 6) possibilities for independent activity of students are extended;
7) access to various information resources, including, for example, reference systems, electronic libraries, etc;
8) development of critical thinking, imagination.

When working with digital tools, teachers need to take into account the age-specific needs of students.

When using digital tools in history lessons when studying historical figures, the following general recommendations should be followed:

1) organise a variety of student activities related to the use of digital educational resources;
2) encourage students to retrieve and present information independently;
3) make maximum use of the range of possibilities of digital learning resources;
4) Objectively diagnose and evaluate achievement of outcomes;
5) promote the development of necessary competencies.

It should be remembered that a situation of success is an effective stimulus for an activity. Without a sense of success, students lose interest in the learning process. It is therefore pedagogically justified to create a situation of subjective satisfaction with the process and outcome of the work. For this purpose, it is important for the teacher to use technological methods, expressed in an atmosphere of approval, encouragement, praise, etc., in relation to the teenager due to his age peculiarities. Content includes information on digital tools, which can be evaluated as the most appropriate digital tools in this case, as well as recommended information aspects to be learnt through the proposed digital tools. The material describes the importance of using the digital tools for the learner’s personality.

4 Conclusions
Thus, digital technologies are no longer only a tool, but also a new environment for the modern school student, which can be used to solve a range of educational tasks, including improving the quality and attractiveness of information transfer, which in turn will help to maintain learning motivation. The concept of digital tools is rather new in pedagogical science and has a number of more common counterparts, the most used of which is the term “digital educational resource”. The use of digital tools makes it possible to build a fundamentally new educational environment, to design an individual educational route and thereby meet the cognitive needs of each learner. There is a large number of digital tools, which are classified according to a number of criteria. The most commonly used educational platforms in high school education practice are those that allow modelling learning courses, as well as services that provide an opportunity to design various surveys, quizzes and tests, thereby optimising the process of control and self-monitoring of knowledge assimilation.

References

3. The concept of improving (modernizing) a unified information educational environment in the Russian Federation, which ensures the implementation of national development strategies of the Russian Federation.