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DIGITAL TECHNOLOGIES IN THE CONTENT OF EDUCATION OF RURAL SCHOOLCHILDREN

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Abstract

The aim of the study is the transformation of the content and methods of technological education of rural schoolchildren, with the consideration being given to the directions of agricultural development and the development of digital technologies. The article substantiates the relevance of including digital technologies into the educational curriculum for rural schoolchildren and the search for optimal pedagogical technologies to better introduce them. The scientific novelty of the research lies in the analysis of digital and intellectual technologies, which made it possible to determine the main directions for the development of the content of technological education, as well as in the development and substantiation of organizational and methodological solutions. The obtained results can be used in the process of designing the content and methods of teaching rural schoolchildren.

Keywords

Rural school – Industrial environment – Digital technologies – Learning content – Teacher training

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Introduction

The widespread introduction of digital technologies has been a key direction in the development of the world economy over the past decade. In digitalization, agricultural enterprises see reserves for increasing labor productivity and saving means of production. For farmers, the use of geolocation systems, integrated fleet management, and precision farming is already becoming a standard. But as cross-industry analysis shows, the true digital revolution in global agriculture is still ahead. The available on the market services for the integration of digital technologies already today offer farmers a comprehensive solution to their main tasks of re-equipping production with means of automatization[1].

The digitalization of the agro-industrial complex necessitates training of the work force in accordance with modern and promisingly developing agricultural technologies:. "... the competencies obtained in universities must meet the requirements of interdisciplinary world, rely on serious scientific research carried out within the walls of an educational institution, focus on the needs of the businesses and respond to challenges from global trends that shape the future of the agro-industrial complex not only for the next 3-5 years, but also beyond the distant horizon"[2]. All this, in turn, will provide the training of qualified specialists in the field of IT-technologies, such as IT-agronomists and IT-engineers.

The research of the problem of the development of technological education was done by R.A. Galustov, G.N. Zelenko, N.V. Zelenko., D.A. Makhotin, G.V. Pichugina, V.D. Simonenko, Yu.L. Khotuntsev and others, and yet, the features of the inclusion of digital technologies into the educational content of rural schoolchildren remain insufficiently studied.

Methods

The conducted analysis of the professional interests of young students shows that if until recently most of them were inclined to believe that agriculture, especially in Russia, is a low-tech, non-prestigious sector, which is definitely chosen “not because of a potentially good life”, then in recent years more and more often young people indicate such agricultural enterprises as those that widely use IT technologies and do not pollute the environment as the most attractive areas of employment[3].

For many schoolchildren the priority learning outcomes are considered to be the mastering of the basics of automation, robotics; mastering the experience of design and engineering using digital technologies, programming skills, data processing and data analysis.

It is advisable to start the acquaintance with the world of tomorrow's professions, self-determination and orientation towards employment in a high-tech sphere by beginning with an introduction of the use of digital technologies in agricultural production in primary

[1] Trends of digital technologies in the agro-industrial complex, 2018. Retrieved from: http://xn--80aplem.xn--p1ai/analytics/Trendy-cifrovyh-tehnologij-v-APK/

[2] The agro-industrial complex of the future. A look at agriculture through the prism of big data analysis. Retrieved from: https://www.agroinvestor.ru/technologies/article/31305-otkhod-ili-tsennyy-produkt/

[3] The agro-industrial complex of the future… y A. R. Galustov; G. N. Zelenko y N. V. Zelenko, “Technological education in the system of introducing schoolchildren to the use of digital technologies in agricultural production”, Problems of modern pedagogical education. Series: Pedagogy and Psychology num 64(Part 1) (2019): 69-71.

school. We believe that students should realize that: “thanks to digital technologies, a field, a greenhouse or a livestock farm can turn into a smart object that can take care of crops (animals) no worse than any specialist”[4].

An analysis of educational practices, programs and teaching aids for students in rural schools shows that introducing students to the agricultural technologies includes the basics of crop and livestock production; issues of ecology and economics. At the same time, in most schools, the emphasis is on manual and partially mechanized methods of growing plants and caring for animals, the use of which is ineffective today. Digital and intellectual production technologies used in agricultural production by advanced enterprises are studied superficially or not at all[5]. The interdisciplinary barriers clearly expressed in modern education do not allow students to see the interaction of knowledge from various subject areas, their importance in life and future professional employment, which does not contribute to the formation of the foundations of professional competencies and, definitely, reduces interest in learning.

We have analyzed digital technologies, which, in our opinion, should be introduced to rural schoolchildren. These include: farm management systems, communications between farmers and suppliers, precision farming, “smart irrigation”, sensors, drones and robots, etc"[6].

One of the most popular digital technologies, according to agronomists, is the monitoring of the habitat and plant health. Large farms carry out monitoring using drones or satellite imagery. Small businesses install such programs on tablets or mobile phones.

The studies of farmers have confirmed the interest of farms in the implementation of precision farming technologies; they use sensors that are installed in the soil and on plants: "The sensors record texture, organic matter, salt content and nutritional value. Meteorological stations collect weather data that helps understand what impact the weather conditions might have on water and soil. Today there are many different advanced irrigation technologies. One of the most useful is drip irrigation with the usage of manually or automatically controlled valves and pumps"[7].

In the agro-industrial complex, the volume and quality of the use of modern technologies is growing, including systems for collecting, storing and processing data. Data from satellites, sensors, operating and transaction systems is being used. At the same time, both the volume of data and the need for its high-quality processing and analysis that can be relied on when making decisions increase.

[4] G. N. Zelenko; V. N. Bogdanov y E. A. Golodov, “Introducing schoolchildren to the use of digital technologies in agriculture”, Problems of modern pedagogical education. Series: Pedagogy and Psychology num 61(Part 1) (2018): 60-63.

[5] A. R. Galustov; G. N. Zelenko y N. V. Zelenko, “Technological education…; Guidelines for the study of technology in the Centers for the education of digital and humanitarian profiles "Point of Growth" of the Krasnodar Territory in the 2019-2020 academic year. Retrieved from: http://iro23.ru/sites/default/files/metodicheskie_rekomendacii_po_obucheniyu_tehnologii_v_centrah_tochka_rosta.pdf y G. N. Zelenko; V. N. Bogdanov y E. A. Golodov, “Introducing schoolchildren…

[6] G. N. Zelenko; V. N. Bogdanov y E. A. Golodov, “Introducing schoolchildren…

[7] Review of digital technologies for agriculture. Retrieved from: https://aggeek.net/ru-blog/obzor-tsifrovyh-tehnologij-dlya-selskogo-hozyajstva-

In his research V.A. Fedotov claims that "thanks to the combining of objects into a single network, the exchange and management of data based on the Internet of Things, the increased productivity of computers, the development of software and cloud platforms, it became possible to automate the maximum number of agricultural processes by creating a virtual (digital) model of the entire production cycle and the interconnected links of the chain of cost, and to plan, with mathematical precision, the work schedule, take emergency measures to prevent losses in the event of a fixed threat, calculate the possible yield, production cost and profit"[8].

Equally important for the reproduction of highly qualified personnel is the introduction of the younger generation with the directions of automation of agricultural machinery: the use of robots, precision seeding technology, GPS navigation, etc.

Modern schoolchildren already understand that GPS navigation can be used not only in a personal car, but also for setting the autopilot on a technical vehicle fleet, high-precision navigation during the cultivation of crops or tracking animals.

In recent years, open ground and fields have been replaced by roofs and enclosed spaces, and plant cultivation is becoming more technological and automated. Growing agricultural products in an artificial climate and on an industrial greenhouse scale is a serious technological challenge. The effectiveness of such technology, yield and product quality is influenced by many factors: temperature, lighting, watering, spraying of chemicals, ventilation. Specially tuned automation, designed to provide optimal conditions for plant growth and development, copes more successfully than a team of workers.

In shopping malls, the increasing popularity is gained by mini greenhouses (agro-chambers, modules, racks), which are used for growing and finishing-up the growing of salads, strawberries and greens. The enclosed microclimate provides ideal conditions for the effective growth of healthy, tasty and useful plants. Such devices can be installed in an educational institution and even at home.

Institutions of general and additional education have already accumulated some experience in introducing students to the advanced technologies. Experimental verification of our proposed concept of introducing schoolchildren to the use of digital technologies in agricultural production allows us to assert that “the most significant role in solving this problem belongs to technological education as an essential element of mastering metasubject competencies and skills of the 21st century, within the framework of mastering basic general educational programs (hereinafter - technological education) in educational organizations"[9].

The methodological recommendations for the implementation of technological education in the Krasnodar Territory in the 2019-2020 academic year states that "updating the content of training in the subject area" Technology "is provided through the creation and operation of the Centers for the education of digital and humanitarian profiles “Point of

[8] V. A. Fedotov, Improving the methodology for assessing the technological properties of grain and predicting the quality of bakery and pasta made from wheat flour: dissertation ... Doctor of technical sciences (Orel, 2020)

[9] N. V. Zelenko; R. A. Galustov y G. N. Zelenko, “The concept of introducing schoolchildren to the use of digital technologies in agricultural production. Project, “Technological and economic education. Scientific and methodical journal num 11 (2019): 4-12.

Growth". Their main function is to ensure the implementation of the main and additional general education programs of digital, natural science, technical and humanitarian profiles"[10].

The requirements for the development of programs allow the teacher to make the necessary adjustments, taking into account the interests and needs of students, socio-economic conditions and characteristics of the region. In the process of developing author's programs, it is allowed to build a combined thematic plan based on a combination of sections and topics of various directions while maintaining their content and labor intensity.

Analysis of scientific literature and educational practice show that the inclusion of digital technologies in the educational process is an active factor in motivating the educational activities of rural youth. It is complemented by the integration of various forms of basic education, extracurricular activities and specialized training. In these conditions, an important component of preparing the younger generation for high-tech agricultural labor is educational and research work using digital technologies, the development and implementation of specialized technological projects.

Project activities can be carried out on the basis of creative independent work performed individually and collectively, both during school and after school hours. A significant role is played by "family" projects dedicated to solving economic, technical and technological problems, as well as re-equipping peasant or farm households using modern automation equipment.

Results

Our research in the field of digitalization of technological education allows us to assert: "Since the effectiveness of introducing schoolchildren to the use of digital technologies in agricultural production directly depends on the coherence and constructiveness of the interaction of its participants, an important role is played by social partnership with employers (representatives of agribusiness), which can really activate the market of innovative developments, ensure their priority focus on the needs of the region, and form effective network models of interaction between subjects of education and business"[11].

When schoolchildren master digital technologies used in agriculture, we assign an important place to the use of educational robotics, digital laboratories and bench models in the educational process. The original version of the operating model of an automated greenhouse was developed by students and teachers of the Armavir State Pedagogical University. In accordance with the underlying idea, "the proposed model allows you to monitor the ongoing processes in the greenhouse: to quickly receive all the necessary information (temperature, air humidity, light, etc.). On the basis of the obtained data, the automation performs the functions of irrigation, heating, ventilation of plants, regulation of light. Management can be carried out autonomously or remotely (using a phone or tablet)[12].

[10] Guidelines for the study of technology…
[11] N. V. Zelenko; R. A. Galustov y G. N. Zelenko, "The concept of introducing schoolchildren…8
[12] R. A. Galustov; N. V. Zelenko; G. N. Zelenko y N. S. Steinhardt, "Preparing future teachers to introducing schoolchildren to the digital technologies in agricultural production", School and production num 8 (2019): 56-60.

The current model can be used at the level of primary general education, where it is an element of the educational environment that allows students to master the principle of operation of automated systems and become familiar with the professions of the future".

The conducted experimental verification showed that: "At the level of basic general education, the model provides an understanding of the essence of digital technologies, stimulates interest and development of universal educational actions, creates conditions for monitoring and organizing experimental research within the framework of project activities; provides familiarity with the world of professions and the labor market. At the level of secondary general education, taking into account the chosen profile, implemented as part of the main educational program, students are active participants in the development and testing of the application of modern digital technologies in crop production. The use of the model allows for the approbation of agricultural solutions and software products in various subjects, including certification procedures for the subjects of final certification"[13]. The development of professional motivation of rural schoolchildren will be facilitated by their participation in "production" projects related to the study and attraction of the experience and capabilities of agricultural enterprises; participation in junior championships and demonstration exams according to WorldSkills standards, registration of schoolchildren's achievements in the "Passport of Competencies" system. The study showed that full immersion in the sphere of "digital technologies application is achieved on the basis of network interaction of educational institutions of various levels, as well as social partnership with high-tech production and business structures. Networking helps to significantly expand the material base, content and list of educational services"[14] and involve specialists in the field of digital technologies in the leadership of the educational and research activities of schoolchildren. An equally important role in the development of the content and methods of familiarizing schoolchildren with digital technologies is played by the creation of centers for continuous improvement of the professional skills of pedagogical workers, support for educational leaders (organizations, teams, individual pedagogical workers - carriers of advanced competencies); popularizing best practices for digital education and promoting a variety of forms of technology education; the formation of an open Internet bank of digital education modules created by education leaders from different regions.

Conclusion

The conducted research allows us to conclude that the content of education and teaching methods of rural schoolchildren need a deep transformation. The advancement of digital technologies to young people paves the way for a true agricultural revolution to make agriculture more efficient and sustainable. This is especially important for farms, which, using small investments, can receive significant profits. Adjustment of the educational content of rural schoolchildren taking into account the needs of the digital economy, the implementation of advanced teaching methods and technologies could make it possible in the future to provide the agro-industrial complex with highly qualified personnel and raise the Russian countryside to a fundamentally new economic level.

The obtained results can be used in the process of designing the educational content for rural schoolchildren, as well as in the development of forms and methods of teaching, educational research and project activities.

[13] G. N. Zelenko; V. N. Bogdanov y E. A. Golodov, "Introducing schoolchildren… 62.
[14] N. V. Zelenko; R. A. Galustov y G. N. Zelenko, "The concept of introducing schoolchildren… 9.

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