Introduction of school students to the use of digital technologies in agricultural production

Ознакомление школьников с применением цифровых технологий в сельскохозяйственном производстве

Introducir a los estudiantes al uso de la tecnología digital en la producción agrícola

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Abstract

The article proves the relevance of the introduction of school students to digital technologies. The roles of the educational environment and subjects are determined, as well as the importance of the subject "Technology". The key problems of the introduction of students to the use of digital technologies in agricultural production (motivation, material base, social partnership, teacher training) are identified. The authors summarize the experience in training future teachers to introduce students to the use of digital technologies in agricultural production.

Keywords: Technological education, digital technologies, agricultural production, teacher training, student training.

Аннотация

В статье обоснована актуальность ознакомления школьников с цифровыми технологиями; раскрыта роль образовательной среды и учебных предметов; определена значимость предметной области «Технология; выявлены ключевые проблемы ознакомления школьников с применением цифровых технологий в сельскохозяйственном производстве (мотивация, материальная база, социальное партнёрство, подготовка педагогов); обобщен опыт подготовки будущих педагогов к ознакомлению школьников с применением цифровых технологий в сельскохозяйственном производстве.

Ключевые слова: технологическое образование, цифровые технологии, сельскохозяйственное производство, подготовка педагога, подготовка школьников.

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Resumen

El artículo demuestra la relevancia de la introducción de estudiantes de escuela a las tecnologías digitales. Se determinan los roles del entorno educativo y las asignaturas, así como la importancia de la asignatura "Tecnología". Se identifican los problemas clave de la introducción de los estudiantes al uso de tecnologías digitales en la producción agrícola (motivación, base de materiales, asociación social, capacitación docente). Los autores resumen la experiencia en la capacitación de futuros maestros para introducir a los estudiantes en el uso de tecnologías digitales en la producción agrícola.

Palabras clave: Educación tecnológica, tecnologías digitales, producción agrícola, formación de docentes, formación de estudiantes.

Introduction

Intensive implementation of digital technologies in agricultural production promises to turn this industry into a high-tech business. According to specialists, the use of digital technologies will double the productivity of agricultural enterprises and reduce costs (Chulok, 2019).

In this context, at present, the most urgent problem is the formation of labour resources that are ready to use digital technologies in agricultural production (Chulok, 2019; Novikov, 2008). The general education school plays an important role in this.

Methods

To a degree, all educational subjects can and should be focused on introducing digital technologies used in agricultural production. Modern digital educational resources allow the teacher and students at the lessons of physics, chemistry, biology, computer science, etc. to use virtual and digital laboratories, simulators, multimedia and interactive applications, as well as Internet resources, to conduct a wide range of research and form relevant meta subject competencies.

In our opinion, the most significant role in introducing students to the use of digital technologies in agricultural production belongs to technological education as the most important element of general education, focused on the formation of skills aimed at the application of knowledge of the science fundamentals, mastering of general principles and specific skills of transforming human activity, various forms of information and material culture, as well as creation of new products and services (Galustov et al., 2018; Zelenko et al., 2019; Kontseptsiya razvitiya predmetnoi oblasti "Tekhnologiya" (2-ya versiya), 2018; Makhotin, 2017). The subject "Technology" allows eliminating interdisciplinary barriers and investigating relationships between subjects and their importance in life and future professional activity.

Education's orientation on the use of digital technologies in a practice-oriented agricultural activity involves close interaction of subjects, presence of integrative subjects and courses chosen by students systematizing knowledge of computer science, biology and agricultural technologies and implementation of integrative training projects in the conditions of educational and production groups and agricultural laboratories. An example of such integration is a modular work program of the basic general education "Geoinformation Technologies" by A.Yu. Bystrov and A.A. Fominykh (2019) for the subject "Technology", aimed at creating a stable connection between information and technological areas based on real spatial data, such as aerial photography, orbital survey, vector maps, etc. It is assumed that the students will be able to start using navigation services, satellite images, electronic maps, collect data about objects on the ground, create 3D objects of the area and implement group research projects.

Among the key tasks of solving the problem of introducing students to the use of digital technologies in agricultural production one can name the following:

1. Creation of innovative infrastructure of the educational environment to introduce the students to the use of digital technologies in agricultural production, including quantoriums, resource centres and technology parks. Their main function is to integrate the subjects of innovative activity (educational organizations, innovation and technology centres, common use centres, development funds, etc.), resources and means providing material

and technical, financial, organizational, methodological, information and consultation service for the processes of education and development of the younger generation. This will provide students with the theory and practice of using digital technologies (automation, robotics, mechatronics and nanotechnologies) in agricultural production. For example, one can name the Center for Digital and Humanitarian Specializations "Tochka Rosta" (Monitoring sostoyaniya tekhnologicheskogo obrazovaniya, 2017).

2. Creation of motivational conditions for ensuring an effective educational process of mastering digital technologies in agricultural production. At the level of students, they consist in introduction of students to the prospects for the development of agriculture, as well as the prediction by specialists of employment sectors and the dynamics of the demand for personnel in agricultural regions. When building an educational trajectory, a student should have a good idea of the content of competencies that will be in demand in the region in five-seven years.

At the level of educational institutions or teachers who are carriers of information on digital technologies, the question should be raised about their motivation to improve their qualifications, master new ways of introducing students to the use of digital technologies in agricultural production, create individual methodological systems, present them at various competitions and scientific and practical conferences, as well as develop new areas of the technological field and use modern educational technologies in the technological education system.

3. The development of networking forms of educational institutions of various levels, as well as the social and educational partnership of educational institutions with high-tech production and business structures.

The cooperation with agricultural companies, which are leaders in high technologies, is of key importance for education. The promising case is when the resources of one educational organization consist, for example, in unique educational programs or services for students enhanced by material and technical capabilities of another organization.

Partnership with high-tech business allows students to be involved in the joint solution of scientific and technical problems and to participate in the production process. Cooperation with highly qualified specialists in digital technologies creates favourable conditions for scientific collaboration, exchange of knowledge and transfer of experience.

4. The improvement of professional skills of teachers and heads of technical study groups; the participation of young specialists in education; creation of internship sites, as well as information and methodological support of the educational process.

Results

A certain experience in the introduction of students to the use of digital technologies in agricultural production has been accumulated by the teachers of the Department of Technology, Economics and Project of the Armavir State Pedagogical University. It is represented by a single complex integrating various activities (training, educational and research, project) of teachers, university and school students within the framework of the federal innovation platform, research laboratories, research and educational centres.

The Sunday school "Lego Education" and the summer school camp "RoboChil" constantly work at the Department of Technology, Economics and Project. University students are engaged in construction together with school students. The introduction to digital technologies and teaching the construction of robots is successfully implemented using LEGO and TRIC constructors and computer resources as a universal device for collecting, processing and presenting the information. Particular attention is paid to the project related to agricultural machinery and units.

Another equally significant area of digitalization with enormous scientific and creative potential is 3D technologies. These technologies are based on the development of 3D models or prototyping, which entails the skills in manufacturing prototypes of parts, product assemblies or products themselves. The introduction to computer graphics is focused on the development of drawings of parts, assemblies and products in general. The priorities are modelling of

landscape projects, agricultural machinery, buildings and structures.

The digital laboratory of physical and chemical research methods is popular among university and school students.

We consider the use of bench models and mini-laboratories in the educational process to be the most significant area of introducing the younger generation to the use of digital technologies in agricultural production. An example is an autonomous mini-laboratory, developed jointly by the university and school students to study plant growth in an artificial environment (Zelenko & Tagun, 2019). It allows not only to demonstrate the operating principle and technological capabilities of agricultural production automation but also to monitor ongoing processes: to quickly obtain all necessary information about the climatic parameters of the greenhouse (temperature and humidity of the air, temperature and moisture of the soil, greenhouse lighting). It can be managed autonomously or remotely (using a phone or tablet).

The operating model can be used in education as bench equipment to demonstrate digital technologies in agriculture, as well as to conduct experimental observations and project activity.

At the Department of Technology, Economics and Project, due attention is given to vocational training, retraining and advanced training of teachers and employees. For this purpose, special subjects focused on the formation of competencies for working with digital technologies have been introduced into the curriculum. Advanced training is implemented and scientific and practical conferences, methodological seminars, masterclasses and webinars are held annually.

The results of the study have been repeatedly discussed in the framework of international scientific and practical conferences, scientific and methodological books and magazines and found support and understanding both in the pedagogical environment and among people engaged in agriculture (Galustov et al., Zelenko et al., 2018; Zelenko et al., 2019; Zelenko & Tagun, 2019).

Conclusion

This study allows us to conclude that changes in technological education associated with the implementation of digital technologies,

integration of academic subjects based on inclusion in project and research activities, motivation of students for agricultural activities in the digital environment, development of the material base of educational institutions, close cooperation of schools with high-tech agribusiness and teacher training will not only introduce students to digital technologies, but also form interest in IT-professions that are in high demand in agriculture.

The analysis of the dynamics of professional interests of students shows that until recently, most of them have been inclined to believe that agriculture, especially in Russia, is a low-tech and non-prestigious sector that is definitely chosen "not because one wants to but because they have to". However, in recent years, young people have been increasingly naming high-tech IT companies that care about the environment and help to improve the standard of living and well-being of society as the most attractive.

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