# Digitalization empowers the innovative development of agricultural vocational education

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***Abstract***
AI-empowered high-quality innovation and development of agricultural vocational education is a key step to optimize the allocation of agricultural vocational education resources and improve the level of agricultural vocational education, and it is also an inevitable choice to promote the breakthrough development of agricultural innovation. AI as a means of shortcut, with its unique role, is constantly filling the gap of agricultural talents. At the same time, in the process of the continuous integration and development of AI and agricultural vocational education, certain educational risks have also arisen, and how to correctly avoid risks and promote the high-quality innovation and development of agricultural vocational education is a new topic of the times.

## 1. Introduction

Agricultural digitalization is an inevitable choice for the modernization of agriculture and rural areas, and an important driving force for the improvement of agricultural economic resilience[Guo, N., Lv, T., & Zong, H.]. The introduction of digital concepts into agricultural vocational education is the best choice for agricultural vocational education in the future. At the same time, accelerating the digital transformation of rural education in the new era is an important part of the strategy of building a strong country in education, digital China, and rural revitalization, marking that the development of rural education in China has entered a new node driven by digital [Fu, W., & Wang, Q. (2024)]. Regardless of the public opinion on AI, we have to admit that AI will be a key means to improve productivity and break through the predicament in the future. With the continuous development of AI, it is of indelible significance to the sustainable development of agricultural vocational education that AI and agricultural vocational education are closely integrated.

### 1.1 Literature Review

As the foundation of the national economy, agriculture is currently in the stage of transformation from traditional agriculture to modern agriculture, showing the characteristics of coexistence of science and technology and tradition, coexistence of scale and small-scale economy, coexistence of high efficiency and inefficiency, and coexistence of new business entities and small farmers. If we want to make a substantial breakthrough in the current situation, the foundation is in the industry, and the key is in the talent, so the cultivation of local high-quality farmers is a key step in agricultural development. However, the growing Internet in recent years has dealt a severe blow to rural projects. In the face of the shrinking of the physical store market and the reduction of agricultural product sales channels, the scarcity of agricultural talents has become increasingly prominent, forming a vicious closed loop in which the quantity and quality of agricultural talents continue to shrink.

Vocational education is often used as a second choice over traditional education. At present, the government's investment in vocational education is insufficient, and there are poor conditions for running schools and a grim employment situation. At the same time, vocational education requires the cultivation of the corresponding talents required by the market in a relatively short period of time, so colleges and universities need to adjust their teaching plans in a timely manner according to market demand. However, due to the lag of market demand, the current vocational education is out of touch with social demand, and the professional structure is unreasonable, which is not only not conducive to the development of students, but also increasingly expands the gap of agricultural talents.

But so far, the literature has shown little emphasis on how to effectively bridge the knowledge and skills gap in the agricultural sector, or bridge the "digital divide" in agriculture, by leveraging workforce development strategies from higher education and extension programs [Bampasidou, M., Goldgaber, D., Gentimis, T., & Mandalika, A. (2024)]. Therefore, the combination of digitalization and agricultural vocational education is an urgent need to solve the problem of scarcity of agricultural talents.

### Digitalization empowers the future of agricultural vocational education Significance

At present, the digital transformation of rural education is facing the dilemma of serious shortage of digital infrastructure in rural education, the need to improve the digital literacy of rural teachers, and the lack of a student-centered digital-driven learning model [Zhang, J. (2024)]. AI constructs an artificial system with a certain level of intelligence by studying the laws of human intelligence activities, and completes human work through computers in the way of human logical thinking. Therefore, it covers the data of social development and achieves the predictive effect through its internal calculations. The high-quality development of rural vocational education empowered by AI is a historical necessity for the high-quality development of rural vocational education[Zhang, R., Li, T., & Zhu, H. (2024)].

The combination of AI and agriculture and agricultural vocational education can perfectly make up for the shortcomings of agricultural development, and its functions such as personalized learning, intelligent tutoring, and virtual teaching can effectively improve the quality and efficiency of teaching, and meet the timeliness and adaptability of agricultural vocational teaching needs. Agricultural vocational education inherits and carries forward the excellent traditional agricultural culture, cultivates students' love and sense of responsibility for agriculture, enhances their awareness of protecting and inheriting local characteristic agricultural culture, and enables the continuation and development of agricultural culture.

Digitalization empowers agricultural vocational education to provide talent support for the development of agricultural modernization, promote the transformation of agricultural production methods, improve agricultural production efficiency and quality, promote the upgrading of agricultural industry, and help the implementation of the rural revitalization strategy.

## 2. Research Methods

### Technical risks

The current development of AI technology is not stable, there is a homogeneous carving, and the threshold for the use of AI is low, and if you want to use AI tools accurately, you have high requirements for the user's own expression ability, and many students and farmers cannot accurately describe their needs, resulting in the use of AI has not brought about the improvement of agricultural productivity and the improvement of agricultural vocational teaching quality in the short term.

## Risks at the level of education

Although the amount of data contained in AI is huge, the content of its output is empty and rigid, and students rely too much on AI algorithms, which will reduce people's critical thinking ability for long-term use. At the same time, AI views are not all correct, and wrong theories can distort the public's collective understanding of reality and scientific consensus, and ultimately lead people to a situation where AI is leading them along.

## The application status of AI technology in the agricultural field

At present, AI is widely used in agriculture, including smart farms, agricultural robots, agricultural big data, smart breeding, intelligent planting, etc., through AI internal integration of the Internet of Things, big data, artificial intelligence and other technologies, real-time monitoring of soil moisture, light intensity, crop growth status and other environmental parameters, intelligent control system according to the preset conditions to automatically adjust the agricultural production environment, to achieve precision irrigation, fertilization and pest control, and can replace manpower to complete heavy and repetitive labor tasks, improve the accuracy and efficiency of operations. Improve the efficiency of resource utilization, reduce production costs, and provide scientific decision-making basis for agricultural production.

## Specific analysis of digital empowerment of agricultural vocational education

In the future, we will actively promote the integration of industry and education innovation, and strengthen the cooperation and exchanges between schools and enterprises through the integration platform of industry and education built by AI, so that schools can more accurately understand the needs of the agricultural industry, adjust professional settings and curriculum content in a timely manner, and realize the close connection between talent training and industrial needs. At the same time, enterprises can also use the platform to participate in the teaching process of the school, provide students with internship training opportunities and practical guidance, jointly carry out scientific research projects and technological innovation, promote the transformation of agricultural scientific and technological achievements, and promote the upgrading of agricultural industry and the innovative development of productivity. AI can integrate online and offline educational resources, break the limitations of time and space, deliver high-quality educational resources to rural areas, make up for the shortcomings of rural vocational education resources, and improve the utilization efficiency of educational resources.

In addition, through the intelligent teaching management system, educational resources can be reasonably allocated according to the number of students, professional needs and other factors, so as to realize the optimal allocation of resources, provide a strong guarantee for the development of rural vocational education, and indirectly promote the innovation and development of agricultural productivity. At the same time, after graduation, students who have received AI-enabled education can use the knowledge and skills they have learned to introduce intelligent agricultural equipment and technologies to improve the automation and intelligence level of agricultural production, reduce production costs, and improve production efficiency. They can also use AI technology to accurately monitor and manage the agricultural production process, optimize the production process, improve the efficiency of resource utilization, achieve the sustainable development of agricultural production, and further promote the innovation and development of agricultural productivity.

Optimize AI's modal learning, i.e., process and understand multiple types of data at the same time, such as text, images, sounds, etc. Promote AI innovation and breakthroughs, gradually move from theory to application and practice in the agricultural field, cut into more and more application scenarios, promote algorithm innovation, computing power enhancement and big data accumulation, deep learning and other technologies, and combine machine vision and natural language processing to improve data processing and intelligent decision-making capabilities. Cloud computing and a variety of knowledge optimize simulation training, enhancing the stability of agricultural processes and the quality of agricultural products.

Combine the upstream, midstream and downstream to promote the deep integration of the industrial structure. At the same time, as the cornerstone of AI algorithms, the intelligent computing center promotes its development and innovation optimization, more effectively mobilizes the operating system to effectively manage and schedule various computing resources, provides integrated, open, and standardized AI model services, and implements more intelligent computing agricultural facilities.

## 3. Result and Discussion

### Yangling Vocational and Technical College

The college carries out AI smart greenhouse teaching projects in horticulture. In the smart greenhouse, a variety of sensors are installed to monitor environmental parameters such as temperature, humidity, light, and carbon dioxide concentration in real time, and automatically adjust them through an AI control system. In the course, the teacher leads the students to observe and analyze the growth of plants under different environmental conditions, and uses AI prediction models to guide students in irrigation, fertilization, and pruning and so on. At the same time, AI design software is used to allow students to carry out horticultural landscape planning and plant modeling design.

Students' ability to regulate the growth of horticultural plants has been greatly improved, and they can skillfully use AI tools to design more creative and scientific horticultural solutions. The horticultural professionals trained by the college have performed well in garden companies and flower enterprises, and the horticultural projects they have participated in have won many industry awards, which has enhanced the popularity and influence of the college.

### Jiangsu Agriculture and Forestry Vocational and Technical College

The college has established a smart agriculture training base and introduced AI agricultural robots. In teaching, students learn programming and automation control techniques by using hands-on courses on robot operation. At the same time, the college has built an agricultural big data platform to collect and analyze the production data of the farms on campus, including crop growth data, meteorological data, etc. Teachers incorporate this data into the curriculum and instruct students to use data analysis software to develop planting and breeding plans based on the analysis results.

The students' practical ability has been significantly improved, and they can be proficient in intelligent agricultural machinery operation and precision agricultural production. Graduates have increased their employment competitiveness in agricultural technology enterprises and modern farms, and some students have won provincial awards for their agricultural big data analysis projects. The intelligent agriculture training base of the college has also become a demonstration window for agricultural vocational education in the surrounding areas, promoting the dissemination of knowledge.

### Chinese Academy of Sciences and Alibaba

The case of the jointly built "Smart Breeding Platform" introduces the practical experience of the platform in using algorithm models and big data analysis methods to improve breeding efficiency. At China's National Southern Crop Phenotyping Research Facility in Yazhou District, Sanya, the high-throughput plant phenotyping platform moves slowly along the track, using lidar, hyperspectral cameras, and various sensors to conduct a centralized "whole body physical examination" for breeding materials. The collected data is transmitted back in real time, and researchers can consult and analyze the data on the computer.

## 4. Conclusions

The platform has realized the integration of the whole breeding process including breeding data management and analysis, optimization and acceleration of large models and large computing power, and artificial intelligence algorithms to predict parents and excellent varieties, and its data capacity and operation speed have reached the world's advanced level. So far, breeders from 23 units around the world have used the platform.Digital empowerment of the innovative development of agricultural vocational education is an urgent need for the future development of agriculture, and it is also an inevitable means for the future development of agriculture. While making full use of digitalization to expand teaching and agricultural work scenarios, we should be more aware of the risks hidden behind it. Only under this possibility can the ideal effect of digitalization empowering the innovation and development of agricultural vocational education be achieved.

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