Organic Combination of Smart Agriculture and Farming-reading Education: Research on Talent Training Model in the New Agricultural Science

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Abstract By analyzing the complementarity between smart agriculture and farming-reading education, and the advantages of organic combination of the two: addressing the challenges of agricultural modernization and cultivating new talents; enhancing students' interest in learning and improving their sense of responsibility and mission; promoting the inheritance of traditional agricultural culture and modern agricultural technology innovation, the organic combination mode of smart agriculture and farming-reading education in the cultivation of new agricultural talents is explored. The analysis shows that it has the following applications in the cultivation of new agricultural talents: in terms of the integration of educational concepts, it combines the modern concept of smart agriculture with the traditional value of farming-reading education; in terms of constructing a curriculum system and adding courses related to smart agriculture, it retains basic courses in farming-reading education, and promotes interdisciplinary integration; in terms of practical teaching platforms, it establishes smart agriculture training bases and farming-reading education bases, and adopts a combination of virtual and real teaching methods; in terms of guiding innovation and entrepreneurship, it encourages students to participate in innovation and entrepreneurship projects, and strengthens industry-university-research cooperation; in terms of teacher team construction, it improves the quality of the teacher team and integrates educational resources both inside and outside the school. Moreover, its evaluation system and incentive mechanism are proposed: constructing a multi-dimensional evaluation system, combining quantitative and qualitative, process and result evaluation, and introducing the third-party evaluation; establishing scholarships and grants, providing support for innovation and entrepreneurship, conducting honor recognition and publicity, and offering career development support.

Key words Talent training of new agricultural science; Smart agriculture; Farming-reading education; Reform in education

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In 2019, 13 departments including the Ministry of Education and the Ministry of Science and Technology jointly launched the "Six Excellence and One Top-notch" Plan 2.0, which required the comprehensive promotion of the construction of new agricultural science. Afterwards, the "Anji Consensus", "Beidacang Action", and "Beijing Guidelines" were successively released, making comprehensive arrangements for the construction of new agricultural science. As an innovation in the construction of traditional agricultural science and the training mode of agricultural and forestry talents under the new situation, the new agricultural science has a positive promoting effect on cultivating innovative agricultural and forestry talents.

1 Smart agriculture and farming-reading education

1.1 Complementarity between smart agriculture and farming-reading education

1.1.1 Modernity of smart agriculture. Smart agriculture empowers agricultural production through the application of modern scientific technologies such as digital technology, artificial intelligence, and the Internet of things, achieving functions such as precise planting, intelligent irrigation, and disease and pest warning, and greatly improving agricultural production efficiency and quality[1].

By participating in the practice of smart agriculture, students can intuitively feel the charm of modern agricultural technology and enhance their understanding and comprehension of agricultural modernization[2].

1.1.2 Traditionality of farming-reading education. Farming-reading education emphasizes labor practice based on "farming" and value cultural education based on "reading". Through the method of "day farming and night reading", it cultivates students' feelings of understanding the countryside, respecting farmers, and loving agriculture[3].

It not only imparts agricultural knowledge, but also focuses on cultivating students' labor concepts, social responsibility, and humanistic literacy.

1.2 Organic combination of smart agriculture and farming-reading education

1.2.1 Addressing the challenges of agricultural modernization. With the advancement of agricultural modernization, traditional agricultural production methods are no longer able to meet the needs of modern society. The combination of smart agriculture and farming-reading education can cultivate new talents who understand both traditional agriculture and modern agricultural technology, providing strong support for agricultural modernization[4].

1.2.2 Enhancing students' interest in learning. The progressiveness and interesting nature of smart agriculture can stimulate students' interest in learning and make them more active in the

learning process. At the same time, the practicality and humanistic nature of farming-reading education can help students better understand the essence and value of agriculture, enhance their sense of responsibility and mission[5].

1. 2. 3 Promoting cultural inheritance and innovation. Farming-reading education carries the excellent tradition of Chinese agricultural civilization, while smart agriculture represents the development direction of modern agriculture. The combination of the two is not only the inheritance of traditional agricultural culture, but also the innovation and development of modern agricultural technology.

2 Application of smart agriculture and farming-reading education in the cultivation of new agricultural talents

The application of smart agriculture and farming-reading education in the cultivation of new agricultural talents is a systematic project that requires efforts in integrating educational concepts, constructing curriculum systems, building practical teaching platforms, guiding innovation and entrepreneurship, and building teaching staff. Through the implementation of these measures, high-quality new agricultural science talents who possess both modern agricultural technology knowledge and love agriculture, respect farmers, and are willing to root in rural areas can be cultivated.

2. 1 Integration of educational concepts

2. 1. 1 Modernization concept of smart agriculture. Smart agriculture provides intelligent solutions for agricultural production by integrating modern information technologies such as the Internet of things, big data, cloud computing, *etc*. This modern concept emphasizes technology driven and efficiency improvement, injecting new vitality into the cultivation of new agricultural talents[6].

2. 1. 2 Traditional value of farming-reading education. As an important component of China's excellent traditional culture, farming-reading education emphasizes labor practice based on "cultivation" and value cultural education based on "reading". It not only imparts agricultural knowledge, but also focuses on cultivating students' labor concepts, social responsibility, and humanistic literacy.

2. 1. 3 Conceptual integration. Integrating the modern concept of smart agriculture with the traditional values of farming-reading education, the aim is to cultivate high-quality new agricultural talents who not only possess modern agricultural technology knowledge, but also love agriculture, respect farmers, and are willing to root in rural areas. This integrated educational philosophy helps guide students to understand the development trends of modern agriculture, while cultivating their local sentiment and sense of social responsibility.

2. 2 Construction of curriculum system

2. 2. 1 Courses related to smart agriculture. In the curriculum system for talent cultivation in the new agricultural science, courses related to smart agriculture are added, such as Internet of things technology, big data analysis, and intelligent agricultural machinery and equipment. These courses aim to enable students to master modern agricultural technology knowledge, understand the development trends and application prospects of smart agriculture[7].

2. 2. 2 Basic courses of farming-reading education. The basic courses of farming-reading education are retained and strengthened, such as agricultural basic knowledge, agricultural operations, local culture, *etc*. These courses combine theory with practice to allow students to personally experience the agricultural production process and feel the charm of agricultural culture.

2. 2. 3 Interdisciplinary integration. Interdisciplinary integration of courses related to smart agriculture and farming-reading education is promoted, such as applying big data analysis to agricultural operations and integrating IoT technology into farming practices. This interdisciplinary integration helps cultivate students' comprehensive qualities and innovative abilities.

2. 3 Practical teaching platform

2. 3. 1 Smart agriculture training base. A smart agriculture training base is established to provide students with a modern agricultural production practice environment. In the training base, students can learn advanced technologies such as the use of intelligent agricultural machinery equipment and the construction of IoT systems, enhancing their practical abilities and technological level[8].

2. 3. 2 Farming-reading education base. A farming-reading education base that allows students to experience traditional agricultural production methods and farming culture firsthand is created. By participating in agricultural operations and experiencing rural life, students can cultivate their sense of labor and local sentiment.

2. 3. 3 Combination of virtual and real elements. Utilizing virtual simulation technology of smart agriculture, a virtual agricultural ecosystem is created, and the operation and management of real farms are simulated. This combination of virtual and real teaching methods helps to break through the temporal and spatial limitations of traditional practical teaching, and improve teaching efficiency and effectiveness.

2. 4 Innovation and entrepreneurship guidance

2. 4. 1 Innovation and entrepreneurship projects. It encourages students to participate in innovative and entrepreneurial projects related to smart agriculture, such as the research and development of smart agricultural equipment and the analysis and application of agricultural big data. Through project practice, students can apply their learned knowledge to solve practical problems, enhancing their innovation and practical abilities[9].

2. 4. 2 Industry – university – research cooperation. It strengthens industry – university – research cooperation with agricultural research institutes and agricultural enterprises, and provides students with more practical opportunities and innovation and entrepreneurship platforms. Innovation and application of smart agriculture technology are promoted through collaborative research, technology transformation, and other means.

2. 5 Construction of teaching staff

2. 5. 1 Professional teacher team. A professional teaching team

with modern agricultural technology knowledge and experience in farming-reading education is built. By introducing outstanding talents and strengthening teacher training, it aims to enhance the overall quality and teaching level of the teaching staff.

2.5.2 Integration of on campus and off campus resources. High-quality educational resources both on and off campus are integrated, and agricultural experts, technical experts, *etc.* are invited to teach or guide practical projects for students. By sharing resources and complementing advantages, it provides students with a more comprehensive and in-depth learning experience.

3   Evaluation system and incentive mechanism

The evaluation system and incentive mechanism for the training model of new agricultural talents based on smart agriculture and farming-reading education are important means to ensure the quality of talent training and stimulate students' potential. The following is a detailed exploration of the system and mechanism[10].

3.1   Evaluation system

3.1.1 Construction of a diversified evaluation system. Course assessment: it emphasizes the assessment on students' mastery of theoretical knowledge, and comprehensively evaluates their academic level through regular grades, mid-term exams, final exams, and other methods.

Practical performance: it emphasizes the importance of practical teaching, and evaluates students' practical ability and technical level through their performance on practical platforms such as smart agriculture training bases and farming-reading education bases. Practical evaluation can include various aspects such as experimental reports, operational proficiency, and team collaboration.

Innovation and entrepreneurship achievements: it encourages students to participate in innovation and entrepreneurship projects related to smart agriculture, and uses innovation and entrepreneurship achievements as an important indicator to evaluate students' comprehensive quality. The evaluation of innovation and entrepreneurship achievements can include aspects such as project innovation, practicality, and economic benefits.

3.1.2 Diversified evaluation methods. Combination of quantitative and qualitative evaluation: it emphasizes both the assessment of quantitative indicators such as students' academic performance and the evaluation of qualitative indicators such as students' comprehensive quality and innovation ability.

Both process evaluation and outcome evaluation are equally important: it not only focuses on students' learning outcomes, but also values their performance and level of effort in the learning process. Through process evaluation, students' learning problems can be identified and corrected in a timely manner, promoting their comprehensive development.

3.1.3 Introducing third-party evaluation. Third party institutions such as agricultural research institutes and agricultural enterprises can be invited to evaluate students' practical abilities and innovation and entrepreneurship achievements, in order to improve the objectivity and impartiality of the evaluation.

3.2   Incentive mechanism

3.2.1 Scholarship and financial aid system. Special scholarships and grants for smart agriculture and farming-reading education are established, to reward and support students who excel in learning, practice, innovation, and entrepreneurship. Students' learning enthusiasm and innovative spirit can be inspired through the incentive effect of scholarships and grants.

3.2.2 Innovation and entrepreneurship support. Innovation and entrepreneurship funds and guidance services are provided to support students in translating innovative ideas related to smart agriculture and farming-reading education into practical projects. Through project incubation and financial support, it aims to assist students in realizing their entrepreneurial dreams and promote the development of smart agriculture and farming-reading education.

3.2.3 Honor recognition and publicity. Students who have made outstanding contributions in the fields of smart agriculture and farming-reading education are honored and commended, such as selecting "Smart Agriculture Star" and "Farming-reading Education Model". By commending advanced individuals and establishing exemplary models, it aims to inspire students' sense of honor and pride, and create a positive learning atmosphere.

At the same time, the promotion and reporting of excellent deeds of students are strengthened, to increase the attention and recognition of society towards the cultivation of talents in smart agriculture and farming-reading education.

3.2.4 Career development support. Close cooperative relationships are established with agricultural research institutes, agricultural enterprises, *etc.*, to provide students with career development support such as internships, practical training, and employment recommendations. Through career development support, it helps students better integrate into the industry and serve society.

4   Conclusions

The organic combination of smart agriculture and farming-reading education is an important educational innovation in the cultivation of new agricultural talents. By constructing a "traditional + modern" curriculum system, building practical teaching platforms, guiding innovation and entrepreneurship projects, and integrating teaching staff, it is possible to cultivate high-quality talents who possess modern agricultural technology knowledge, love agriculture, and are willing to root in rural areas, providing strong talent support for rural revitalization and agricultural modernization.

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implementation abilities for physical education teachers, and introduce advanced teaching concepts and methods. Secondly, it should establish a teaching design evaluation mechanism to regularly evaluate and guide teachers' design plans and teaching implementation, ensuring that teaching content meets educational requirements and students' actual needs. Thirdly, it should encourage teachers to participate in various academic competitions, lectures, and other activities, exchange and learn from each other, and enhance their enthusiasm and creativity.

3.2.2 Improving hardware configuration. To improve the hardware configuration of county-level physical education teachers, it is necessary to increase investment in school hardware facilities, to ensure that teaching equipment and venues can fully meet the needs of physical education teaching, and provide teachers with a good teaching environment and working conditions.

3.2.3 Improving the level of reflection on teaching effectiveness. To improve the reflection level of teaching effectiveness of county-level physical education teachers, schools should establish a reflection mechanism and evaluation system. Teachers can be encouraged to constantly reflect and optimize their teaching outcomes by organizing teaching and research activities, holding teaching observation and lectures, and other means. A set of evaluation indicators and standards for teaching reflection should be developed, and regular evaluations and feedback should be conducted to guide teachers to continuously improve their teaching methods and techniques, thereby enhancing the effectiveness of teaching and learning.

3.2.4 Strengthening guidance and support for teachers' professional development. To promote the professional development of county-level physical education teachers, it is necessary to strengthen guidance and support. Firstly, teacher professional knowledge popularization activities can be held to enhance teachers' awareness of professional development through lectures, seminars, and other forms. Secondly, teachers should be encouraged to actively participate in vocational training and learning exchange activities to expand their professional horizons and knowledge fields, and continuously improve their professional qualities and abilities.

3.2.5 Strengthening the promotion and implementation of post employment training. One of the important measures to promote the professional development of county-level physical education teachers is strengthening the promotion and implementation of post employment training. It should develop a post employment training plan and conduct targeted training courses and activities based on actual needs. To meet the personalized development needs of teachers, diverse and targeted training content should be designed, including the improvement of teaching skills, course design, evaluation, *etc.* It should establish a training performance evaluation system and evaluate and monitor its implementation effectiveness. On this basis, combined with the actual situation, corresponding adjustments and improvements will be made to the training plan to improve the learning effectiveness and satisfaction of trainees, in order to ensure that the training activities effectively promote the professional quality and level of teachers.

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